

## UNINTERRUPTIBLE POWER SUPPLY



## UPS SLC TWIN PRO series 0.7 to 3 kVA





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# 1. Introduction.

## 1.1. Acknowledgement letter.

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully before starting up the equipment and keep it for any possible future consult that can arise.

We remain at your entire disposal for any further information or any query you should wish to make.

Yours sincerely.

**SALICRU**

- ☐ The equipment here described **can cause important physical damages due to wrong handling**. This is why, the installation, maintenance and/or fixing of the here described equipment must be done by our staff or **specifically authorised**.
- ☐ According to our policy of constant evolution, **we reserve the right to modify the specifications in part or in whole without forewarning**.
- ☐ All **reproduction or third party concession of this manual is prohibited** without the **previous written authorization** of our firm.

## 1.2. Using this manual.



The target of this manual or publication is to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. This manual and rest of support documentation has to be read carefully before installing, location change, setting or any handling of any kind, including the start up and shutdown operation.

Keep this document for future consults.









In the next pages, the “**equipment**” and “**S.T.S.**” terms, are referred to the Uninterruptible Power Supply or UPS and Service and Technical Support respectively.

### 1.2.1. Conventions and used symbols.

Some or all the symbols of this section can be used and shown in the equipment and/or in the description of this document. It is advisable to be familiar with them and understand their meaning.

-  «**Danger of electrical discharge**» symbol. Pay special attention to it, both in the indication on the equipment and in the paragraph referred to this user's manual, because it contains features and basic informations for person safety. To not respect these indications can result in serious incidents or even the death due to electrical discharges
-  «**Warning**» symbol. Carefully read the indicated paragraph and take the stated prevention measures, so it contains basic safety instructions for persons. To not respect such instructions can cause serious incidents. Those indica-




tions with “**CAUTION**” symbol content features and basic instructions for safety of the things. To not respect such instructions can damage the goods.

-  «**Precaution**» symbol. Read the paragraph text and take the stated preventive measures, it contains the basic instructions and features for the equipment safety. To not respect these indications can create material damages on the own equipment, installation or loads.
-  «**Notes of information**» symbol. Additional topics that complement the basic procedures. These instructions are important for the equipment use and its optimum efficiency.
-  «**Main protective earthing terminal**» symbol. Connect the earth cable coming from the installation to this terminal.
-  «**Earth bonding terminal**». Connect the earth cable coming from the load and the external battery cabinet to this terminal.
-  **Preservation of the environment:** The presence of this symbol in the product or in their associated documentation states that, when its useful life is expired, it will not be disposed together with the domestic residuals. In order to avoid possible damages to the environment, separate this product from other residuals and recycle it suitably. The users can contact with their provider or with the pertinent local authorities to be informed on how and where they can take the product to be recycled and/or disposed correctly.
-  Alternating Current A.C..
-  Direct Current D.C..
-  Recycle.



### 1.2.2. For more information and/or help.

For more information and/or help of your specific unit, contact with our Service and Technical Support (**S.T.S.**).

### 1.2.3. Safety instructions.

- Check the data of the nameplate are the required by the installation.
-  Never forget that the **UPS is a generator of electrical energy**, therefore the **user has to take precautions about against direct and indirect contacts**.  
Its energy source, a part from the AC mains, lies on the batteries, usually included in the same case or cabinet that the equipment electronics. However, some models and/or extended back up times, batteries can be supplied in a separate case or cabinet.  
If the batteries are connected to the equipment and their protections are switched “On”, whenever they are, it is irrelevant if the UPS is or not connected to mains, as well as the status of the mains protection. The outlets or output power blocks will supply voltage meanwhile the battery set has energy.
-  **Compliance as regards to “Safety instructions” is mandatory, being the user the legal responsible regarding** to its observance and application. Read them carefully and follow the stated steps in the established order, keep them for future consults that may arise.
-  **If the instructions are not in total or partial and in special referred to the safety, do not carry on with the installation or commissioning tasks**, because there

could be a **risk on your safety or on the other/s persons**, being able to make **serious injuries even the death**, also it can **cause damages to the equipment and/or to the loads and installation**.

-  The local electrical regulations and the different restrictions of the client's site, they can invalidate some recommendations included in the manuals. When discrepancies exist, the user has to comply the local regulations.
-  The equipments provided with power cord with plug and outlets, can be connected and used by personnel without any kind of experience.

The equipments with power blocks have **to be installed by qualified personnel** and it can be used by personnel with not specific training, just with only help of this manual.

A person is defined as **qualified**, if it has experience of assembling, commissioning and perfect control operating of the equipment, if he has the requirements to do the job and if has read and understand all the things described in this manual, in particular the safety indications. Such preparation is considered only valid if it is certified by our **S.T.S.**

- Place the equipment the closest to the power supply and loads to be supplied, leaving an easy access if it were needed an urgent disconnection.


In the hard wired equipments and due to the impossibility of fast disconnection, a disconnection device (switch) with easy access and close to the equipment will be installed.

- Warning labels should be placed on all primary power switches installed in places away from the equipment to alert the electrical maintenance personnel of the presence of a UPS in the circuit

The label will bear the following text or an equivalent one:

**Before working in this circuit.**


- Isolate the Uninterruptible Power System (UPS).
- Check the voltage between all terminals including the protective earth.




**Risk of voltage feedback from UPS.**


### 1.2.3.1. General safety warnings.

- All connections and disconnections of the cables from the equipment, including the control ones, will be done with no power supply and the switches on rest, position «O» or «Off».
- Shutdown the equipment completely by switching «Off» the button of the control panel first. Next disconnect the cable from the wall outlet for equipments up to standard 3 kVA or by switching «Off» the input circuit breaker of the installation and disconnect the power supply cables in models of the 3 kVA B1 or higher power rate.

 The indiscriminate manoeuvring of the switches may involve production losses and/or equipment damages. Consult the documentation before doing any action


-  Pay special attention to the labelling of the equipment that warns about the «Electrical shock hazard». Inside the equipment there are dangerous voltages, never open the enclosure, the access has to be done by qualified staff. In case of maintenance or fault, consult to the closest (**S.T.S.**).
- Cross cable sections used to supply the equipment and loads, will be according to the nominal current stated in the nameplate label of the equipment, and respecting the Low Voltage Electrotechnical Regulations or standards of the country.

Use approved cables only


-  Protection Earth cable of the UPS drives the leakage current of the load devices. An isolated earth cable has to be installed as part of the circuit that supplies the equipment. Cross cable section and its features will be same as the power supply cables, but with green colour with or without the yellow strip.

All outlets of the UPS has an earth bonding, duly connected and those equipments with power blocks there is an exclusive terminal for the load earth connection. When an outgoing distribution is done, i.e power strips, it is essential that they have an earth terminal connected to each one of them.

It is essential that the cables that supplies the loads have the earth connection cable.

 The protection earth must be connected to the frame or metallic chassis of any electrical equipment (in our case to the UPS, battery cabinet or case and loads), assuring that it is done before connecting the input voltage.

Check the quality and availability of the earth, it has to be between the defined parameters by the local or national regulations.

- For the smallest devices (the ones connected with the foreseen power cord with plug), the user has to check the wall outlet corresponds with the type of supplied plug, with earth duly installed and connected to the local protection earth.
-  During the normal UPS operation, in equipments up to 3kVA the power cord cable can't be disconnected from wall outlet, because the protection earth of the own UPS would be disconnected and also the earth from the loads connected to the output.

For this reason, the general protection earth cable of the building or switchgear panel that supplies the UPS will not be disconnected.

- In small equipments (the ones connected with the foreseen power cord with plug), check that the sum of the leakage currents of the UPS and connected load/s do not exceed over 3,5mA.
- The installation will have input protections sized to the currents of the equipment and stated in the nameplate label (RCD devices type B and circuit breakers with C characteristic or any other equivalent one).

Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.

- Do not overload the UPS by connecting loads with inrush consumptions at its output, like laser printers.
- Output protection will be done with a circuit breaker of C characteristic or an equivalent one.

It is recommended to distribute the output power, into four lines as minimum. Each one of them will have a protection circuit breaker sized to the quarter of the nominal power. This kind of outgoing distributions will allow that any fault in any device connected to the equipment, that makes a short-circuit, will affect to the line with the faulty device only. An uninterruptible power supply will be guaranteed to the rest of connected loads, due to the protection tripping of the affected line by the short-circuit only.


- When replacing a fuse, do it for another of the same type, characteristics format and size.
- Under any concept the input power cord will be connected to the output of the equipment, either directly or through other ways.
- All the equipments have an auxiliary terminal strip to install an external emergency power off button (EPO), and it will belong to the user property.

Type of circuit is selectable through the LCD panel of the equipment. The contact is preset from factory as normally



open, so the button must be switched to close the circuit and the voltage to the loads is broken. To establish the power supply to the loads again, the EPO button must be deactivated.

EPO doesn't affect to the power supply of the equipment, it only breaks the power supply to the loads as a safety measure.


-  When supplying input voltage to a UPS with static bypass, although the inverter is still turned «Off» (deactivated) it doesn't mean that at the output there will not be voltage.

So, to do it, the input switch will have to be turned «Off».

Put warnings of danger and/or emergency switches if the safety Standards require it in your particular installation.

- All power supply electrical cables have to be fixed to the equipments and loads, interfaces, etc..., to unmovable parts and in the way to avoid treads, trips on them or fortuitous pulls.
- CHASSIS or RACK mounted equipments are destined to be installed in a predetermined set to be done by professionals.
  - ☐ The installation has to be designed and executed by qualified personnel, who will be the responsible to apply the safety and EMC regulations and standards that controls the particular installations where the product is destined.
  - ☐ The equipments assembled in CHASSIS do not have enclosure protection, even the power blocks are unprotected.
  - ☐ Some RACK mounted equipments do not have the power blocks protected.
- Never manipulate the equipment with wet hands.

### 1.2.3.2. To keep in mind.

-  Do not try to dismantle or change any part of the equipment, if this action is not contemplated in this document. Manipulation inside the UPS due to any modification, reparation or any other cause, can make an electrical discharge of high voltage and it is restricted to **qualified** staff only. Do not open the equipment.

A part from the implicit stated risks, any action that make the modification, internal or external of the equipment or just only the simple intervention inside of itself, which is not stated in this document, **it can expire the warranty**.

- If it is observed that the UPS exhausts smoke or toxic gas, shutdown it immediately and disconnect it from the power supply. This kind of fault can cause fire or electrical discharge. Contact with our **(S.T.S.)**.
- In case of an accidental equipment dropping or if the enclosure is damaged, do not start it up under any concept. This kind of fault can cause fire or electrical discharge. Contact with our **(S.T.S.)**.
- Do not cut, manipulate the electrical cables, do not put heavy objects over them too. Any of these actions could cause a short-circuit and make a fire or electrical discharge.

Check that the electrical cables of connection, plugs and outlets are in good conditions.

- When moving an equipment from a cold place to a warm environment and vice versa, it can cause condensation (small water drops) in the external and internal surfaces. Before installing a moved equipment from another place or even packaged, the equipment will be left for a minimum time of two hours in the new location before making any action, with the purpose of adapting it to the new environmental conditions and avoid the possible condensations.

The UPS has to be completely dry before starting any installation task.

- Do not store, install or expose the equipment in corrosive, wets, dusty inflammable or explosive environments and never outdoors.
- Avoid to locate, install or store the equipment in a place with direct sunlight or high temperatures. Batteries could be damaged.

In the exceptional case and long exposition to intense heat, batteries can cause filtrations, overheating or explosions, which can cause fires, burn or other injuries. High temperatures can also make deformation in the plastic enclosure.





- The location will be spacious, airy, away from heat sources and easy access.
- Do not obstruct the cooling grids by entering objects through themselves or other orifices.
- In equipments of low power rate (up to 3kVA), leave as minimum space of 25 cm in the equipment peripheral and 50 cm for higher power rates equipments.
- Also in the UPS with power blocks, it is recommended to leave another additional 50 cm for an eventual intervention of the **(S.T.S.)**, considering that if it means to move the UPS, the connected cables will have the needed clearance.
- Do not put materials over the equipment or parts that obstruct the correct visualization of the synoptic.
- Be careful to not wet it, because it is not waterproof. Do not allow entering any kind of liquids in. If accidentally the outside of the machine comes into contact with liquids or salt air, dry it with a soft and absorbent cloth.

- To clean the equipment, wipe over a damp cloth and then dry it. Avoid sprinkling or spillage that could enter through the slots or cooling grids, which may cause fire or electric shock.

Do not clean the equipments with products that could have alcohol, benzene, solvent or other inflammable substances, or they are abrasive, corrosive, liquids or detergent.

- When it is needed to remove the protection cover to access to the terminals, they will have to be put back before starting up the equipment. Otherwise you may incur personal injury or equipment damage.

- Be careful to not lift heavy loads without help, according to the following recommendations:

- ☐  , < 18 kg.
- ☐  , 18 - 32 kg.
- ☐  , 32 - 55 kg.
- ☐  , > 55 kg.


- UPSs are electronic equipments, so they will be treated as they are:

- ☐ Avoid shocks.
- ☐ Avoid jolting or bouncing of the UPS, like those produced by moving the equipment on a hand truck and move on an uneven or wavy surface.

- UPS transport will be done packaged inside its original packaging in order to prevent it from shock and impact and by means of the suitable type of packaging (carton box, pallet packaging, ...) and appropriate to its weight.

- Although the physical location of the elements can differ from the illustrations in this manual in some cases, the correct labelling correct the possible doubts and makes easy its comprehension.

### 1.2.3.3. Safety warning regarding batteries.

-  The manipulation and connection of the batteries shall be done and supervised by **personnel with battery knowledge only**.

Before doing any action, disconnect the batteries. Check that no current is present and there is not dangerous voltage in the DC BUS (capacitors) or in the endpoint of the battery set terminals.


Battery circuit is not isolated from input voltage. Dangerous voltages can be found between the terminals of the battery set and the earth. Check that there is not any voltage at the input before take any action over them.

- When faulty batteries are replaced, the complete battery set has to be replaced, less exceptional cases in new equipments, were due to manufacturing faults it will only be replaced the defective ones.

The replacement will be done by another one of the same type, voltage, capacity, quantity and brand. All of them has to be of the same brand.

- Generally, the used batteries are sealed lead acid of 12V and maintenance free (VRLA).
- Do not reuse the faulty batteries. There could be an explosion or burst any battery with the involved problems and issues that could happen.
- Generally supplied batteries are installed in the same cabinet, case or rack of the equipment. Depending on the power, autonomy or both, they can be supplied separately from the equipment in another cabinet, case or rack, with the interlink cables among them. Do not modify its length.
- In those equipments requested without batteries, their acquisition, installation and connection of themselves will be done by the end-user and **under his responsibility**. Data concerning the batteries as regards to quantity, capacity and voltage, are stated in this battery label stucked beside the nameplate of the equipment. **Respect these data**, battery connection polarity and the supplied circuit diagram **strictly**.

For an optimum and efficient operating, the battery set has to be located as close as possible to the equipment.

-  The battery voltage can involve the risk of electric shock and can produce high short circuit currents. Observe the following preventive measures before manipulating any terminal block identified in the labelling as «Batteries»:
  - ☐ Disconnect the corresponding protection elements.
  - ☐ When connecting a battery cabinet to the equipment, respect the cable's polarity and colour (red-positive; black-negative) indicated in the manual and in the corresponding labelling.
  - ☐ Wear rubber gloves and shoes.
  - ☐ Use tools with insulated handles.
  - ☐ Take off watches, rings or other metal objects.
  - ☐ Do not place metal tools or objects over the batteries.
  - ☐ Never manipulate with your hands or through conducting objects, do not short either the battery terminal block of the equipment or the own from the batteries.
- In order to avoid a complete discharge of the batteries and as a safety measure after a long blackout of the commercial mains and when ending the working day, proceed to the load shutdown and then to the equipment too, by following the operating described in this «User's manual».
- When the equipment and/or battery module has a protection through a fuse and it were needed to be replaced, it will always be done by another one with the same dimension, type and size.

- For long periods of disconnection, consider that the equipment has to be connected once a month for 10 hours as minimum, in order to charge the batteries, so the irreversible degradation of itself is avoided. On the other hand, in case of storing an equipment, it will be done in a fresh and dry place, **never outdoors**.
- Never short the battery terminals as it involves a high risk. It involves the detriment of the equipment and batteries.
- Avoid mechanical efforts and impacts.
- Do not open or mutilate the battery. Spilled electrolyte is harmful and toxic to the skin and eyes.
- Do not dispose the batteries in a fire and high temperatures. The batteries may explode.
- In case of contact of the acid with parts of the body, wash immediately with plenty water and call urgently the nearest medical service.
- Batteries involve a serious risk for the health and for the environment. Their disposal should be done according to the existing laws.

## 2. Quality and standard guarantee.

### 2.1. Declaration of the management.

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001** and **ISO 14001** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, through:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

### 2.2. Standard.

The **SLC TWIN PRO** product is designed, manufactured and commercialized in accordance with the standard **EN ISO 9001** of Quality Management Systems. The **CE** marking shows the conformity to the EEC Directive by means of the application of the following standards:

- **2006/95/EC** Low voltage directive.
- **2004/108/EC** Electromagnetic Compatibility directive (EMC).

In accordance with the specifications of the harmonized standards. Standards as reference:

- **EN-IEC 62040-1**. Uninterruptible power supply (UPS). Part 1-1: General and safety requirements for UPS's used in accessible areas by end users..
- **EN-IEC 60950-1**. IT equipments. Safety. Part 1: General requirements.
- **EN-IEC 62040-2**. Uninterruptible power supply (UPS). Part 2: EMC requirements.



The manufacturers responsibility is excluded in the event of any modification or intervention in the product by the customer's side.



This is a product for its use in commercial and industrial applications, so restrictions and additional measures can be needed in the installation to prevent perturbations.



Declaration of conformity CE of the product is at the client disposal under previous request to our headquarters offices.

### 2.3. Environment.

This product has been designed to respect the environment and has been manufactured in accordance with the standard **ISO 14001**.

Equipment recycling at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the recovered product at the end of its useful life (contact your distributor).

#### **Packaging:**

To recycle the packing, follow the legal regulations in force.

#### **Batteries:**

The batteries mean a serious danger for health and environment. The disposal of them must be done in accordance with the standards in force.



## 3. Presentation.

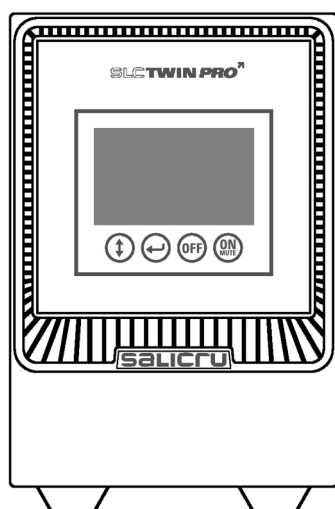
### 3.1. Views.

#### 3.1.1. Views of the equipment.

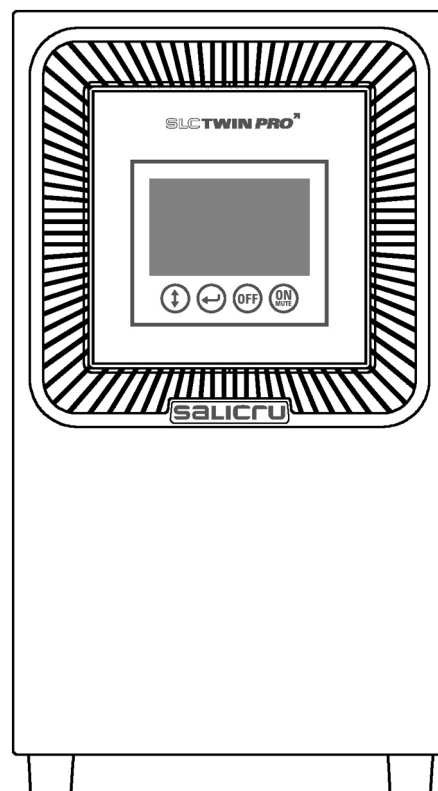
Figures 1 to 3 show the illustrations of the equipment according to the case format and depending on the power of the model. Nevertheless and due to the constant evolution of the product, some discrepancies or small contradictions can arise. In front of any doubt, the labelling of the equipment will always prevail.



Figures regarding its main features or specifications can be checked in the nameplate of the equipment. Keep them in mind for its installation.

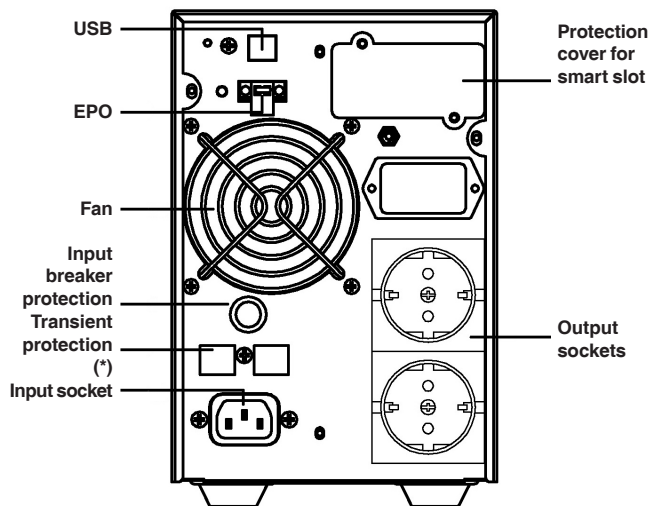


Models from 0.7 and 1 kVA



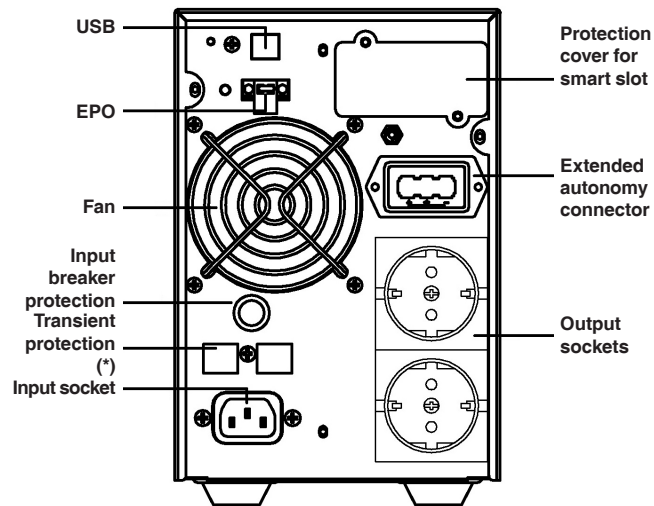
Models from 1.5 to 3 kVA

Fig. 1. Front view from 0.7 to 3 kVA models.



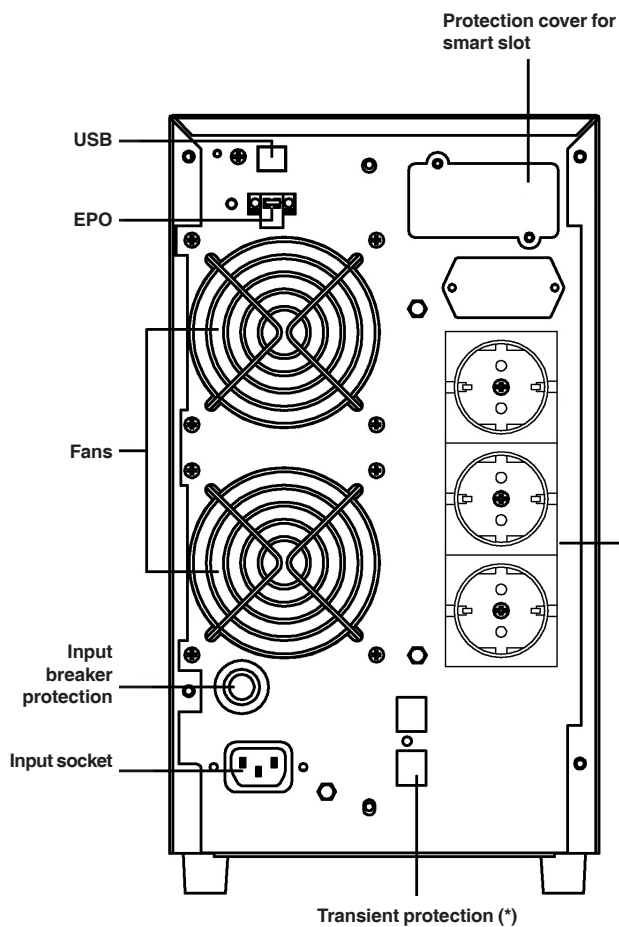
(\*) Transient protection (fax, modem,...)

Models from 0.7 and 1 kVA (standard)



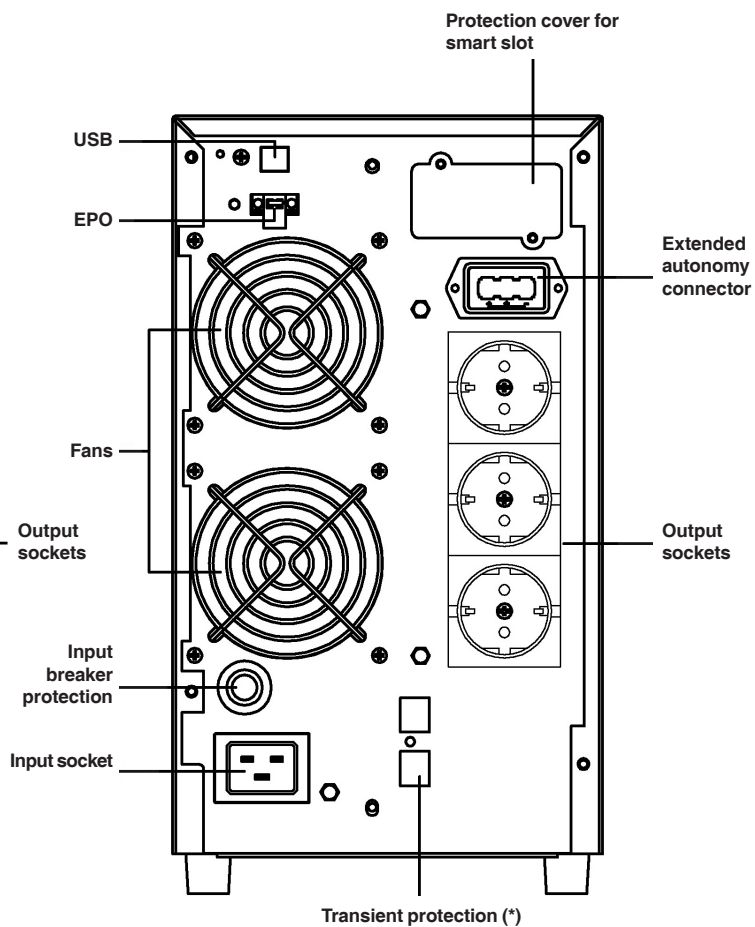
Models from 0.7 and 1 kVA (B1)

Fig. 2. Rear view from 0.7 and 1 kVA.



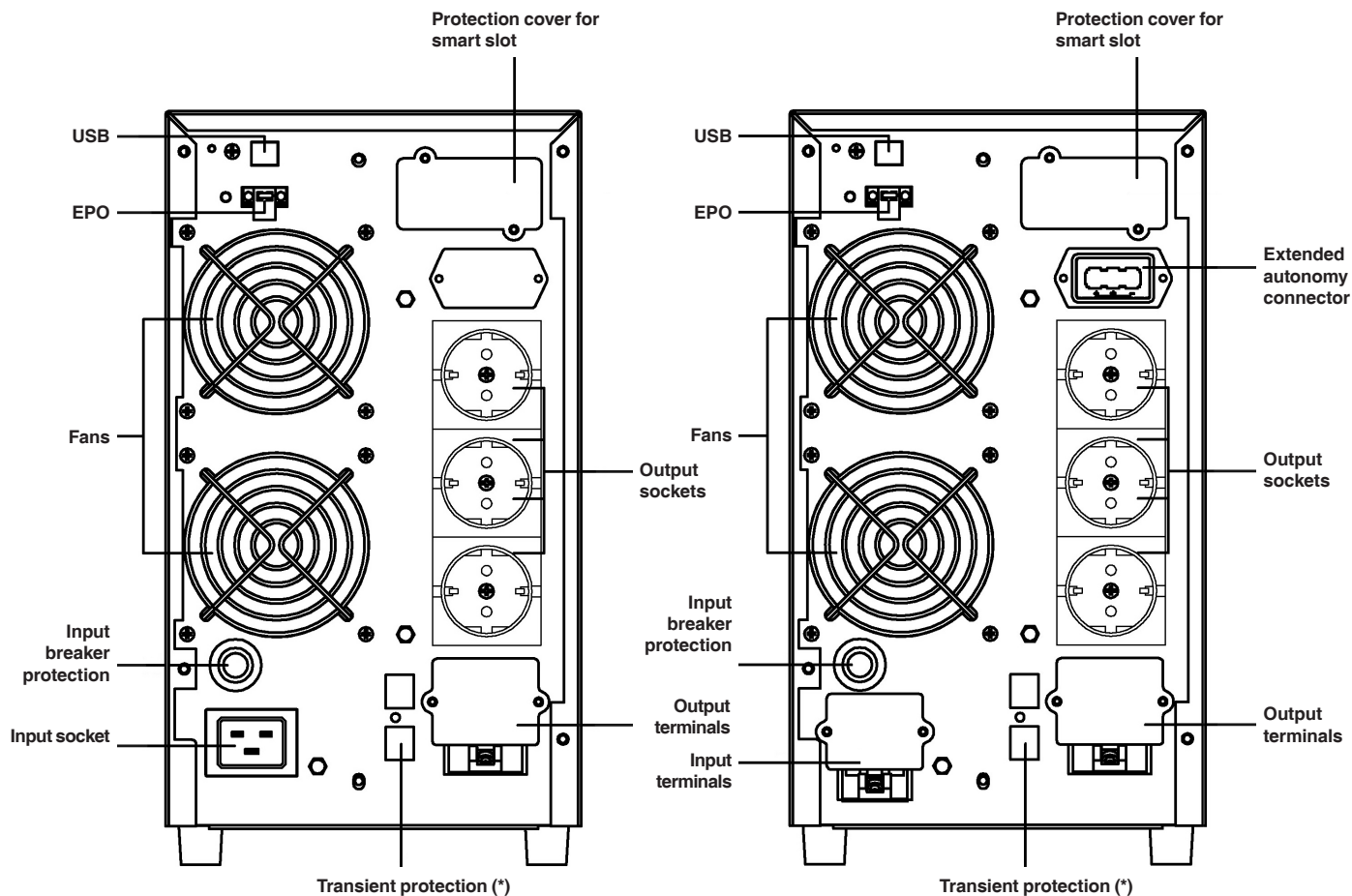
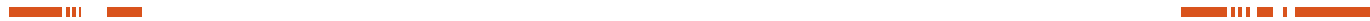
(\*) Transient protection (fax, modem,...)

Models from 1.5 and 2 kVA (standard)



Models from 1.5 and 2 kVA (B1)

Fig. 3. Rear view from 1.5 and 2 kVA.

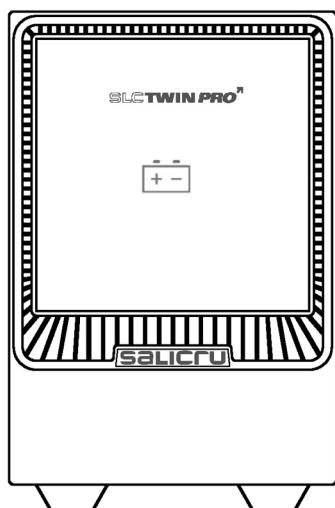


(\*) Transient protection (fax, modem,...)

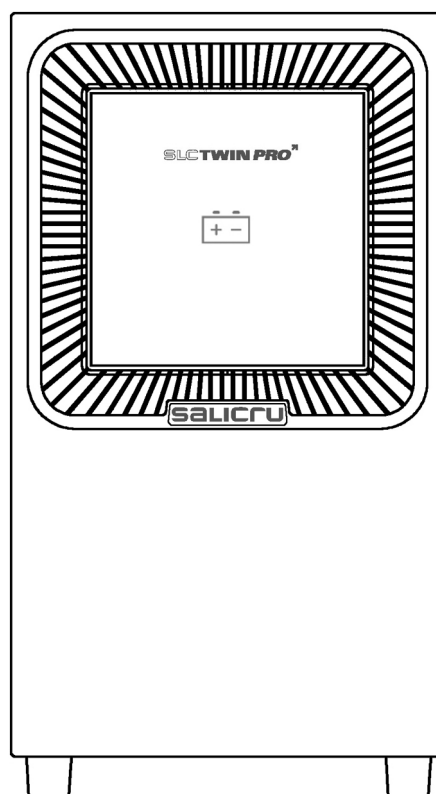
Model from 3 kVA (standard)

Model from 3 kVA (B1)

Fig. 4. Rear view from 3 kVA model.

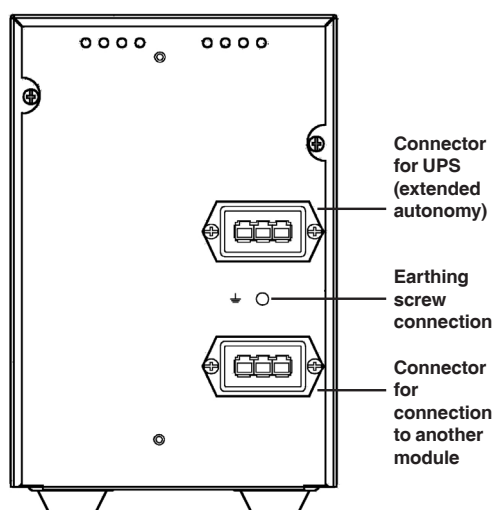


Battery module for models 0.7 and 1 kVA

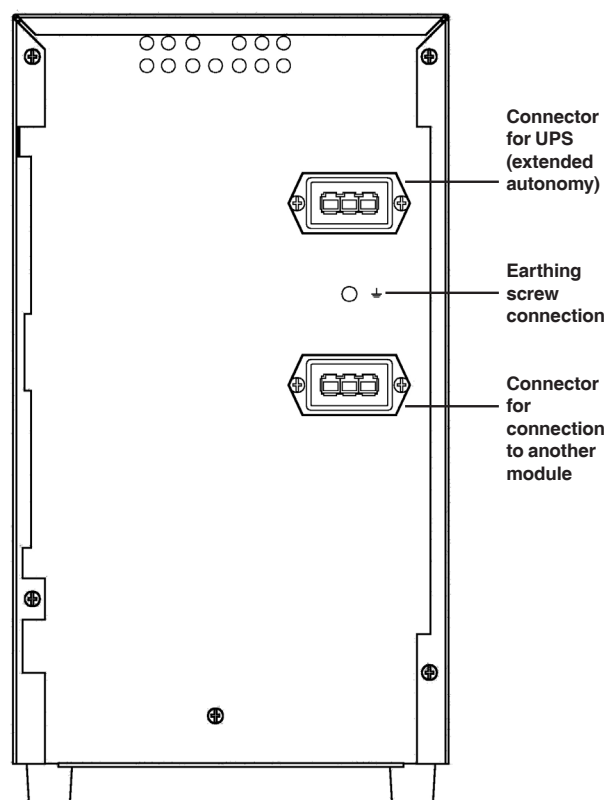


Battery module for models 1.5 from 3 kVA

Fig. 5. Front view from battery module.



Battery module for models 0.7 and 1 kVA



Battery module for models 1.5 from 3 kVA

Fig. 6. Rear view battery module for extended autonomy.

## 3.2. Definition of the product.

### 3.2.1. Nomenclature.

SLC-2000-TWIN PRO (B1) WCO "EE29503"

EE*	Special specifications of the client.
CO	"Made in Spain" marking in the UPS and its packaging (custom issue).
W	Neutral brand equipment.
(B0)	No batteries and no space for installing them.
(B1)	Equipment with extra charger and external batteries to the UPS.
TWIN PRO	Series.
2000	Power in VA.
SLC	Acronym of the brand.

MOD BAT TWIN PRO 2x6AB003 40A WCO "EE29503"

EE*	Special specifications of the client.
CO	"Made in Spain" marking in the UPS and packaging (custom issue).
W	Neutral brands of the equipment.
40A	Size of the protection.
003	Last three characters of the battery code.
AB	Initials of the battery family.
6	Quantity of batteries in one string.
2x	Quantity of strings in parallel. Omit for only one.
0/	Battery module without them, but with the accessories to install them.
TWIN PRO	Series of the battery module.
MOD BAT	Battery module.



#### Note as regards to the batteries:

Acronyms B0 and B1 stated in the nomenclature is related to the batteries:

(B0) The equipment is supplied without the batteries and with no accessories (screws and electrical cables).

Batteries owned by the client will be installed out from the case or cabinet of the UPS.

Under request, it is possible to supply the accessories (screws and electrical cables), needed to install and connect the external batteries.

(B1) Equipment with extra battery charger. The equipment is supplied without batteries and no accessories (screws and electrical cables), corresponding to the specific batteries in the model.

Under request is possible to supply the accessories (screws and electrical cables), needed to install and connect the batteries.

For equipments requested with no batteries, the acquisition and connection of them will always be done by the customer and **under his responsibility**.

Data related to batteries about quantity, capacity and voltage are stated in the battery label stucked beside the nameplate of the equipment, **respect strictly** these data and connection polarity of the batteries.



### 3.3. Operating principle.

This manual describes the installation and operating of the Uninterruptible Power Supply (UPS) from **SLC TWIN PRO** series as equipments that can run as a complete separate and independent units. UPSs from **SLC TWIN PRO** series assures an optimal protection for any critical load, keeping the power supply of the loads between the stated parameters, with no break, during any blackout, or mains fluctuations or deteriorations with a wide range of available models (from 0.7 kVA to 3 kVA), it allows adapting the model to the end-user needs.

Thanks to the used technology, PWM (Pulse Width Modulation) and double conversion, the UPSs from **SLC TWIN PRO** series are compact, silent, and with high efficiency.

The double conversion principle cancels all the AC mains perturbations. A rectifier converts the alternating current from AC input mains into DC direct current, that keeps at the optimal level the batteries and supplies the inverter, which at the same time generates an AC voltage ready to feed the loads permanently. In case of fault of the input power supply of the UPS, the batteries supplies clean energy to the inverter.

The UPS design and construction from **SLC TWIN PRO** series have been done in accordance with the international norms.

So, this series has been designed to maximize the availability of the critical loads and make sure that your business is protected against fluctuations of voltage, frequency, electrical noises, blackouts and mains faults, which are present in the energy distribution lines. This is the main target of the UPSs from **SLC TWIN PRO series**.

This manual is applicable to the standardized models and stated in table 1.

#### 3.3.1. Main features.

- True on-line double conversion and independent output frequency from mains.
- Output power factor of 0,8 and pure sinewave, suitable for almost any kind of loads.
- Input power factor > 0,99.
- Great adaptability to the worst conditions of the input mains. Wide margins of the input voltage, frequency range and wave shape, so it is avoided the excessive dependence on the limited energy of the battery.
- Availability of battery chargers up to 8 A in order to decrease the battery recharging time.
- High efficiency mode can be selected > 0,94 (ECO-MODE). Energy saving, which reverts to the user in an economy way.
- It is possible to start up the equipment without mains or the battery discharged. Watch this last aspect, because the back up time will be decreased as much discharged the batteries are.
- The technology of the smart management of the battery is very useful for making longer the accumulator lifetime and to optimise the recharging time.
- Standard communications options by means of USB port.
- Control of the remote emergency power off (EPO).
- Control signal of the remote emergency power off (EPO).
- Interface between the user and the equipment through the control panel LCD, user friendly.

- Option cards are available to improve the communication capacity of connectivity.
- Easy firmware updating, no need to call to the Service and Technical Support (**S.T.S.**).
- Simplified maintenance, which allows replacing the batteries in a safety way without shutdown the **UPS**.

Model	Power (VA)	Type
SLC-700-TWIN PRO	700	Standard
SLC-1000-TWIN PRO	1000	
SLC-1500-TWIN PRO	1500	
SLC-2000-TWIN PRO	2000	
SLC-3000-TWIN PRO	3000	
SLC-700-TWIN PRO B1	700	Standard with extended autonomy
SLC-1000-TWIN PRO B1	1000	
SLC-1500-TWIN PRO B1	1500	
SLC-2000-TWIN PRO B1	2000	
SLC-3000-TWIN PRO B1	3000	

Table 1. Standardized basic models.

### 3.4. Options.

Depending on the selected configuration, the equipment can include any of the following options:

#### 3.4.1. Isolation transformer.

The isolation transformer, provides a galvanic isolation that allows isolating the output from the input completely.

The installation of an electrostatic shield between the primary and secondary windings of the transformer provides a high level of attenuation of the electrical noises.

The isolation transformer can be installed at the input or output of the UPS from **SLC TWIN PRO** series and it will always be located out from the equipment enclosure.

#### 3.4.2. External maintenance manual bypass.

The purpose of this option is to isolate electrically the equipment from mains and critical loads, without breaking the power supply to the loads. Therefore, in this way the maintenance or fixing tasks can be done in the equipment with no interruption on the power supply energy to the protected system, at the same time that unnecessary risks are avoided to the technical staff, because it allows a complete disconnection of the UPS from the installation.

#### 3.4.3. Integration in IT networks by means of the SNMP adaptor.

The big IT systems based on LANs and WANs that integrate servers with different platforms, they have to include an easy way of controlling and management at the manager system disposal. This facility is got through the SNMP adaptor, which is well-known by the main software and hardware manufacturers.

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The available SNMP option for **SLC TWIN PRO** series is a card to be inserted into the slot that the UPS has in its rear side.

The connection of the UPS with the SNMP is internal meanwhile the connection between the SNMP and the IT network is done through a RJ45 connector 10 base.

#### **3.4.4. Relays interface card.**





See section 4.3.6.4..

#### **3.4.5. MODBUS protocol.**

The big IT systems based on LANs and WANs, many times they require that the communication with any device to be integrated in the IT network has to be done by means of an industrial standard protocol.

One of the most used industrial standard protocols in the market is the MODBUS protocol. **SLC TWIN PRO** series is also ready to be integrated in this type of environments through the external “SNMP TH card” device with MODBUS protocol.

## 4. Installation.

- Check the Safety instructions, from section 1.2.3.
- Check that the data in the nameplate are the required by the installation.
- A wrong connection or manoeuvring, can make faults in the UPS and/or loads connected to itself. Read carefully the instructions of this manual and follow the stated steps in the established order.
-  The equipments can be installed and used by personnel with no specific training just with the help of this «Manual» only, less those ones that are hard wired, which have to be installed by qualified personnel.
-  All connections of the equipment including the control (interface, remote panel, ...), will be done with the switches at rest and no voltage present (UPS power supply switch to «Off»).
-  Never forget that the UPS is an electrical energy generator, so the user has to take the needed cautions against direct and indirect contacts.
-  Battery circuit is not isolated from input voltage. Hazardous voltages can be found out between the battery terminals and earth. Check that there is not input voltage before doing any intervention on them.

### 4.1. To be considered in the installation.


- All the equipments have power cord with schuko plug to be connected to the AC mains, less the B1 version of 3 kVA, which is hard wired.


In the same way, 2 or 3 schuko outlets are supplied depending on the model, for its connection with the loads (output) and also to the terminals in all the 3kVA units.

For the rest of connections is used an Anderson connector for the battery connection (B1 version) and ports for communications.
- Cross cable section of the input and output lines, will be calculated from the currents stated in the nameplate of each equipment, and respecting the Local and/or National Low Voltage Electrotechnical Regulations.
- Protections of the switchgear panel, will have the following features:
  - ☐ For input line, type B for RCD devices and C characteristic for circuit breakers.
  - ☐ For the output (load feeding), C characteristic for circuit breaker.

Regarding the size, they will be as minimum to the currents stated in the nameplate of each UPS.
- In the nameplate of the equipment there are only printed the nominal currents as it is stated in the safety standard EN-IEC 62040-1. To calculate the input current, the power factor and the efficiency of the equipment have been considered.


Overload conditions are considered as nonpermanent and exceptional operating mode.
- If it is added peripherals to the input or output like transformers or autotransformers to the UPS, the currents stated in the own nameplates of those elements has to be considered in order to use the suitable cross sections, by respecting the Local and/or National Low Voltage Regulation.

-  When an equipment incorporates a galvanic isolation transformer, as standard, as an option or either installed by yourself, either at the UPS input line, output or in both, protections against indirect contact has to be fitted in (residual current device) at the output of each transformer, because due to its specification of isolation it will prevent the triggering of the protections fitted in the primary of the transformer in case of electrical shock in the secondary (output of the isolation transformer)
- Remind you that all external isolation transformers already installed or supplied from factory, has the neutral of the secondary connected to earth by means of a cable bridge between both terminals. If it were required an isolated output neutral, remove this cable bridge, keeping the precautions stated in the respective local and/or national low voltage regulations.
- All standard UPSs have batteries in the same enclosure of the equipment, less those ones as B0 and B1. In the first ones, the battery protection is by internal fuses and there is no access to the end-user.

Also the battery modules have internal protections by fuses and in the same way as it is done in the own equipments, they are not accessible by the end-user.
-  **IMPORTANT FOR SAFETY:** In case of installing the batteries by yourself, the accumulators have to be provided with a two pole circuit breaker protection sized to the features stated in table 2.


### 4.2. Reception of the equipment.

#### 4.2.1. Unpacking, content checking and inspection.


- To unpacking, see section 4.2.3.
- On receiving the device, make sure that it has not suffered any damage in transport (impact, drop, ...) and its features correspond with the ones in the order, so it is recommended to unpack the UPS and make a first visual inspection.
- In case of observing damages, make all pertinent claims to the transport agency or in their lack to our company.
  -  Never start up an equipment when external damages can be observed.
- Also check that the data in the nameplate stuck in the packaging and in the equipment, correspond to the ones stated in the order, so it is required to unpack it (see section 4.2.3). Otherwise, make a nonconformity as soon as possible, by quoting the serial number of the equipment and references in the delivery note.
- Check the contents of the packaging. Depending on what we are checking, an equipment or battery module, the contents will vary.
  - ☐ UPS:
    - The own equipment.
    - Hardcopy quick guide. Also for 3kVA models, a user's manual on digital support (CD).
    - 1 connection cable for input - schuko plug and IEC connector -.
    - 1 USB communication cable.
    - 1 female connector for connection of an external EPO, with an isolated cable as jumper mode in order to close the circuit.

- ❑ Battery module:
  - The own module.
  - 1 trunk with Anderson connectors at its ends in order to do the connection between the battery module and the equipment.
  - 1 connection cable for the earth protection, to joint between the equipment and module.
- Once the reception is finished, it is advisable to pack the UPS again till its commissioning in order to protect it against mechanical shocks, dust, dirt, etc...

#### 4.2.2. Storage.

- Storage of the equipment will be done in a dry place, safe-guard from rain, protected from dust, water jets or chemical agents, never outdoors. It is advisable to keep the equipment and the battery pack/s, into their original packages, which have been designed to assure the maximum protection during the transport and storage.
-  In general and other than in special cases, the UPS has sealed lead-calcium batteries and should not be stored for more than 12 months (see the date of the last charge of the batteries, noted on the label adhered to the device packaging or on the battery unit).
- After this time, connect the equipment to mains and together with battery unit, if any, start it up according to the instructions described in this manual and charge them for 2 hours from floating level.
- Finally, shutdown the equipment, disconnect it and fit the UPS and batteries in their original packaging, noting the new battery charge date on each respective label.
- Do not store the devices where the ambient temperature exceeds above 50°C or below -15°C, otherwise it may degrade the electrical characteristics of the batteries.

#### 4.2.3. Unpacking.

- The packaging of the equipment has a cardboard enclosure, expanded polystyrene (EPS) or polyethylene foam (EPE) corners, plastic bag and polyethylene strip, all materials are recyclable; so if you are going to dispose them, do it in accordance with the regulations in force. It is recommended to keep the packaging in case it were needed in future.
- Proceed as follows:
  - ❑ Cut the strips of the cardboard enclosure, in those models with strips.
  - ❑ Take out the accessories (cables, documentation, ...)
  - ❑ Take out the equipment or battery module from the packaging, considering the help of a second person depending on the weight of the model.
  - ❑ Remove the protection corners of the packaging and the plastic bag.
-  Keep out of reach of children the plastic bag, due to the risks that it involves.
- ❑ Inspect the equipment before continuing and in case damages are confirmed, contact with the supplier or in lack of him with our firm.



#### 4.2.4. Transport to location.

- Although the weight of the equipments is not so high, it is recommended to move the UPS by the use of a forklift, pallet truck or by means of the most suitable means of transport by



evaluating the remoteness of the location point.


If the distance is high, it is recommended to move the equipment still packaged till the installation place and unpack it later.

### 4.3. Connection.

-  Cross cable section used in the power supply of the equipment and loads to feed, will be sized according to the nominal current stated in the nameplate stuck on the equipment, by respecting the Low Voltage Electrotechnical Regulations or norms of the corresponding country.
- Installation will have the suitable input protections sized to the current of the equipment and stated in the nameplate of the equipment (residual current devices type B and circuit breaker with C characteristic or any other equivalent one).  
Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.
- Output protection will be done with a circuit breaker of C characteristic or any other equivalent one.
-  The equipments can be installed and used by personnel with not specific training, just with only help of this «Manual», less those ones with power blocks have to be installed by **qualified personnel**.
- In the hard wired models, is needed to remove the fixing screws of the protection cover and the own cover, to proceed to the parallel connection.  
When finalising the corresponding tasks the cover/s and their fixing screws will be fitted back.
- To insert the option cards, it is needed to remove the fixing screws of the smart slot and the own cover.  
When finalising the corresponding tasks the cover/s and their fixing screws will be fitted back.
- It is recommended to use pointed terminals in all ends of the cables connected to the power blocks (input and output).
- Check the correct torque in the screws of the power blocks.

#### 4.3.1. Connection of input .

-  As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth()). Connect the conductor to the terminal, before connecting the power supply to the input UPS.
- Equipments with IEC inlet (all models less the B1 version of 3kVA):
  - ❑ Take the power cord with schuko plug and IEC connector.
  - ❑ Connect the IEC connector to the UPS inlet.
  - ❑ Insert the schuko plug in to the wall AC outlet.
- In equipments with terminal blocks (3 kVA model B1).  
Connect the power supply cables to input power blocks **R (L)** and **N**, **by respecting the rotation of phase and neutral** stated in the labelling of the equipment and in this manual. If this rotation is not respected there could be fault/s and/or anomalies.

 Pay attention to the correct connection of the input terminals, including the earth, by observing the labelling of the equipment.

When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

### 4.3.2. Connection to output.

- ⚠ As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⚡)). Connect the conductor to the terminal, before connecting the power supply to the input UPS.

- All the equipments have 2 or 3 schuko outlets depending on the model.

Also in the 3kVA equipments, there is a group of output terminals.

- ⚠ Loads can be connected to the schuko outlets, or to the output terminals or to both at the same time, provided that the power of the equipment is not exceeded, otherwise there could be sudden breaks in the power supply to the loads connected to the output.

- Connect the loads to the outlets schuko.
- In models with terminal blocks, connect the loads to output power block **U (L)** and **N**, by respecting the phase and neutral rotation stated in the labelling of the equipment.

When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

- If besides of the critical loads, it is required to connect lagging loads of high consumption, like laser printers or CRT monitors, the inrush currents of these peripherals will be kept in mind in order to avoid blocking the equipment under the worst conditions.

It is better to not connect the loads of this kind, due to the high quantity of energy resources that take from the UPS.

- With respect to the protection that must be placed at the output of the UPS, we recommend that the output power should be distributed in at least four lines. Each one should have a circuit breaker protection switch of a value of one quarter of the nominal power. This type of power distribution will allow that in the event of a breakdown in any of the machines connected to the device causing a short-circuit, it will affect to no more than the line that is faulty.

The rest of the connected loads will have their continuity assured due to the triggering of the protection, because the line affected by the short-circuit will trip its protection.

### 4.3.3. Connection of external batteries (extended back up times) -B1-.

- ⚠ As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⚡)). Connect the conductor to the terminal, before connecting the power supply to the input UPS.

- ⚠ **To not respect the stated indications in this section and the safety instructions 1.2.3 means a high risk of electrical discharge and even the death.**

- All the standard UPSs have batteries in the same enclosure, less the B0 and B1. Battery protection is done by internal fuses and not accessible for the end-user.

Battery modules have internal protections for the batteries too and they are not accessible for the end-user.

- ⚠ **IMPORTANT FOR SAFETY:** In case of installing the batteries by yourself, the accumulators has to be provided with a two pole circuit breaker protection sized to the features stated in table 2.

Model	Batteries ( $U_{\text{element}} \times N^{\circ} = U_{\text{nominal}} / U_{\text{floating}}$ )	Minimum features of fast type	
		Voltage DC (V)	Current (A)
SLC-700- TWIN PRO B1	(12 V x 3) = 36 V / 41,4 V	48	50
SLC-1000- TWIN PRO B1			50
SLC-1500- TWIN PRO B1	(12 V x 8) = 96 V / 110,4 V	125	40
SLC-2000- TWIN PRO B1			40
SLC-3000- TWIN PRO B1			60

Table 2. Features of protection between the equipment and battery cabinet.

- ⚠ **Before starting the connection between the battery module/s and the equipment, check that the equipment switch/es and the one in the battery cabinet are in "Off" position.**

**Likewise when batteries are installed by own self, the fuse or switch has to be turned off.**

- Connection terminals of external batteries with the equipment are done with a polarised Anderson connector. This connector is not available on standard models.
- To connect the equipment with the battery module, use the cable trunk supplied with the module and connect it between both units and through the Anderson connectors.

When more than one battery module is supplied for one equipment, the connection among the modules will be done through the cable trunk supplied in the second battery module.

Figure 7 shows as an example, the connection of a **SLC-700-TWIN PRO** with "n" battery modules. Less the rear view of the model, it is applicable to all the range stated in this manual. Connect the available modules depending on each case.

- If for any reason the end-user manufactures the battery cable trunk, the colour code of the cables has to be respected, red for positive, black for negative and green-yellow for earth, as well as the correlation of the connection (+ with +, – with – and ⚡ with ⚡).

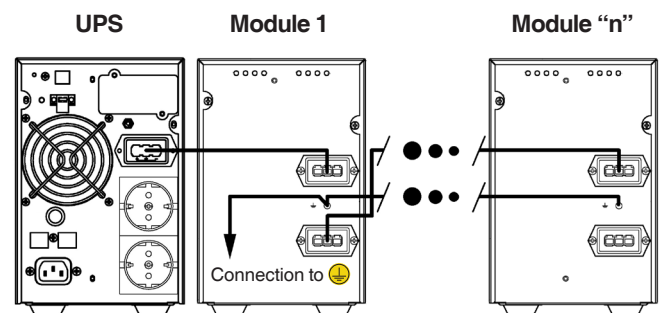


Fig. 7. Connection among the equipment and "n" battery modules.

- ⚠ Each battery module is independent for each equipment. **It is strictly prohibited to connect two equipments to one battery module.**



#### 4.3.4. Connection of main input earth terminal (⚡) and the earth bonding terminal (⚡).

- ⚠ As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth (⚡)). Connect the conductor to the terminal or bar, before connecting the power supply to the UPS input.
- Make sure that all the loads connected to the UPS are only connected to the protective earth bonding terminal (⚡). The fact of not restricting the earthing of the load or loads and/or the batteries case/s or cabinet/s to this **single point** will create a return loops to earth which will affect the quality of the supplied power .
- All terminals identified as earth bonding (⚡), are joined together, to the main protective earthing terminal (⚡) and to the frame of the device.

#### 4.3.5. Terminals for EPO (Emergency Power Off).

- All UPSs have a terminal strip to install an external button, for Emergency Power Off (EPO).
- The equipment is preset from factory with the EPO as normally open contact. So, the UPS will break the output power supply when the circuit is open:
  - ❑ Either by removing the female connector inserted in the plinth. This connector has a cable bridge to close the circuit (Fig. A).

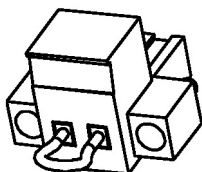


Fig. A

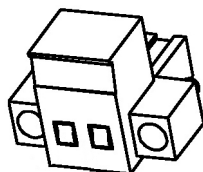


Fig. B

- ❑ Or by turning on the external button installed and belonging to the end-user. The connection in the button has to be in normally closed because it will open the circuit when turning it on.
- Through the control panel, it can be selected the reverse functionality, normally closed.

Less punctual cases, it is not recommended to use this type of connection due to the function of the EPO button, because it would not work in case of any of the two cables that goes from the button to the UPS were cut (damaged).

On the other hand this failure would be immediately detected in the normally open EPO type, with the inconvenience of the sudden break in the power supply to the loads, but with a complete guarantee of the functioning of the emergency power off.
- To restore the normal operating mode of the UPS, the connector with the cable bridge has to be fitted back in the terminal strip or to deactivate the EPO button and later on to cancel the EPO status in the control panel . The equipment will be operative.

#### 4.3.6. Communication ports.

##### 4.3.6.1. USB interface.

- ⚠ Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed

separate from other lines that have dangerous voltages (energy distribution line).

- USB interface is used by the monitoring software and firmware updating.
- USB communication port is compatible with the USB 1.1 protocol for communication software.

##### 4.3.6.2. Protection against transient voltages for Modem / ADSL / Fax / ... lines.

- ⚠ The communication line (COM) is a very low safety voltage circuit. To preserve the quality, it has to be installed separate from other dangerous voltages (energy distribution lines).
- Connect the main line of the Modem / ADSL / Fax /... to the RJ45 connector of the equipment, labelled as "Input".
- Connect the own Modem / ADSL / Fax /... to the RJ45 connector of the equipment, labelled as "Output".

##### 4.3.6.3. Smart slot.

- UPSs have a unique slot, hidden rear the cover stated in the views of the equipment as "Smart slot", and allows inserting any of the following options cards:
  - ❑ SNMP for control via Web.
  - ❑ Remote UPS management through Internet or Intranet.
  - ❑ Relays interface (for more details see the next section).
- For more information, contact with our S.T.S or our nearest distributor.

##### 4.3.6.4. Relays interface (option).

- ⚠ Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- UPS has a dry contact card for the relays interface, it provides digital signals in a free potential way, with a maximum applicable voltage and current of 240 V ac or 30 V dc and 1A.
- This communication port makes possible the dialogue between the equipment and other machines or devices, through the 5 dry contacts supplied in the terminal strip included in the same card and to each one of them an alarm of the 8 available can be assigned (see table 3).

Also there are other three additional terminals with only one common, for an installation of an external On/Off switch to the equipment and a third one with free setting among EPO, Shutdown or "On-Off" remote control.

From factory all contacts are normally opened, being able to set them separately one by one, by means of the Hyper Terminal software or equivalent.

- The most common use of this type of ports is to provide the needed information for the closing file software.
- This card has a RS232 port through a RJ connector. So, in case of requiring a DB9 connector, use the adaptor RJ / DB9 supplied with the relays interface card.
- For more information, contact with our S.T.S. or our nearest distributor.

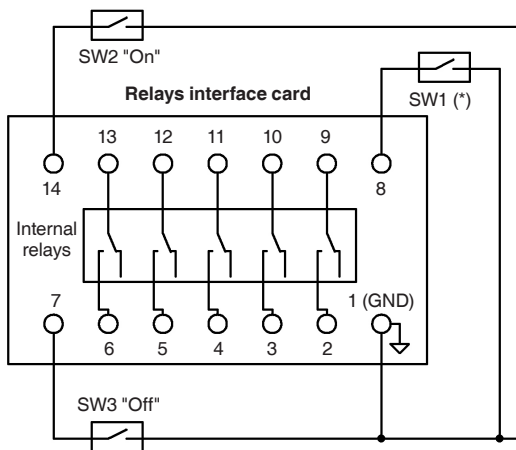


Fig. 8. Relays interface pin-out.

#### Installation.

- Remove the protection cover from the relays interface slot of the equipment.
- Take the relays interface card and insert it into the reserved slot. Make sure that it is well connected, so the resistance that the own connector inside the slot makes has to be overcome.
- Make the needed connections in the alarm terminal strip.
- Put the new protection cover that it is supplied with the relays interface card and fix it through the same screws that fixed the original cover.

Description	Nr pin	Input/output
Mains fault	Programmable	Output
Low battery	Programmable	Output
General alarm	Programmable	Output
Bypass status	Programmable	Output
Summary alarm	Programmable	Output
Battery test	Programmable	Output
Shutdown in process	Programmable	Output
Overload alarm	Programmable	Output
UPS signal "On"	1 (GND) - 14	Input
UPS signal "Off"	1 (GND) - 7	Input
Programmable signal as: - EPO - Shutdown on battery mode - Shutdown on any mode - Remote control "On-Off"	1 (GND) - 8	Input

Table 3. Relays interface alarms.

#### 4.3.7. Software.

##### • Free software download - WinPower.

WinPower is a UPS monitoring software, which makes a user-friendly interface of monitoring and management. This software supplies an auto Shutdown for a system based on several PCs in case of an electrical blackout. With this software, the end-users can monitor and manage any UPS in the same IT network, through the RS232 or USB communication port, never mind the distance between them.

##### • Installation procedure:

- ❑ Go to website:  
<http://support.salicru.com>
- ❑ Choose the operating platform that you need and follow the instructions described in the web site to download the software.
- ❑ When downloading the needed files from Internet, enter the following licence to install the software:  
511C1-01220-0100-478DF2A .

When the computer is rebooted, WinPower software will be shown as an icon with plug shape and green colour in the system tray, near the clock.

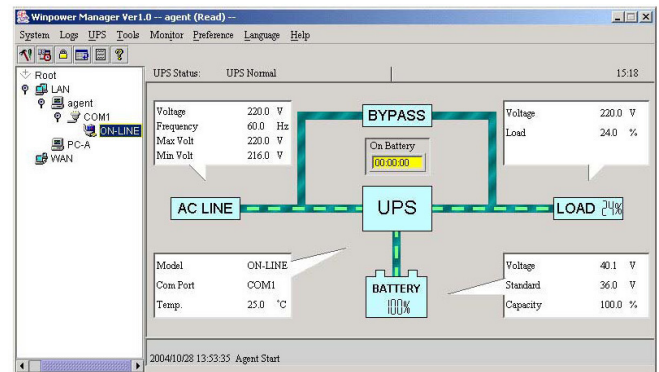


Fig. 9. Main screen of the monitoring software.

#### 4.3.8. Considerations before starting up the connected loads.

- ⚠ It is recommended to charge the batteries for 2 hours as minimum before using the UPS for first time. When supplying voltage to the equipment, the battery charger will automatically work.
- ⚠ (B1) equipments with extended back up time has a battery charger with higher quality performances. It is recommended to charge the batteries for 2 hours as minimum before using the UPS for first time.
- ⚠ Nevertheless, those equipments with extended back up time and with no additional battery charger, it is recommended to charge the batteries of each battery module for 2 hours.
- Although the equipment can work without charging the batteries during the stated time without any problem, the risk of a long blackout has to be valued during the first operating hours and the available autonomy time in the UPS.
- Do not start up the equipment and loads completely till chapter 6 states it.
- Nevertheless, when it is done, it will be done gradually to avoid any problem, as minimum in the first commissioning.
- If inductive loads with big inrush current apart from sensitive ones are required to be connected like laser printers or CRT monitors, keep in mind the start inrush currents of these peripherals in order to avoid that the equipment becomes blocked under the worst conditions.

It is better to not connect the loads of this kind, due to the high quantity of energy resources that take from the UPS.

## 5. Operating.

### 5.1. UPS commissioning and shutdown.

#### 5.1.1. Preliminary controls.

- Make sure that all connections have been done properly, and respecting the labelling of the equipment and the instructions of chapter 4.
- Check that the power supply is correct.
- Check that the UPS is Off (shutdown).
- Make sure that all loads are shutdown «Off».



Loads can be connected after the UPS start up and one by one. Before shutdown the UPS, check that all loads are shutdown (Off).

- Check that the thermal protection of the equipment is not tripped.
- It is very important to proceed in the established order.
- For UPS views, see figures 1 to 6.
- Turn “ON” the protection of the distribution panel.

#### 5.1.2. Start up the UPS, with AC mains.

- The UPS can't supply voltage to the loads because the bypass mode is deactivated, code «0».
- To start up the UPS, press over the key «ON» of front panel for more than 1 second, the inverter will start up and at the same time the status of the UPS will be displayed in the LCD of the front panel.



The equipment is factory preset with the bypass mode deactivated code «0» (there will not be output voltage although there is voltage at the input of the UPS). To change this factory setting go to section 6.2.6 and activate the code «1».

- Start up the load/s, do not overload the UPS.

#### 5.1.3. Start up the UPS, with no AC mains (Battery mode)

- To start up the equipment with no AC mains -cold start-, it is needed to press twice the key «ON» from front panel consecutively, keeping pressed the key in the second pulsation for more than 1 second. The inverter will start up and at the same time the status of the UPS will be displayed in the LCD of the front panel.

In case of mains fault with the loads connected and turned on, the time that the UPS will be working, will depend on the battery charge level and the consumption of the own loads connected to the output.

- Start up the load/s, do not overload the UPS.

#### 5.1.4. UPS shutdown with AC mains (on Inverter mode).

- To shutdown the inverter of UPS, press over the key «OFF» of front panel for more than 1 second.

The UPS will shift to no output mode «0» -bypass deactivated- (code «0») or bypass mode (code «1»), depending if the initial configuration has been changed or not.

On bypass mode (code «1»), the UPS will still be supplying output voltage through its bypass, so to shutdown the loads completely, the circuit breaker switch from control panel will have to be turned off too.

#### 5.1.5. UPS shutdown with no AC mains (on Battery mode).

- Shutdown the UPS inverter by a simple pulsation of more than 1 second over the key «OFF». The UPS will be shutdown.



If the factory preset setting has been changed from (code «0») to (code «1»), when mains voltage is restored the equipment will still be supplying voltage to the output through the bypass. It is needed to turn the circuit breaker switch from control panel off, in order to leave the loads with no voltage.

#### 5.1.6. Battery test function.

- To make a battery test with the equipment started up and mains present, press over the button «ON» of the front panel for more than 1 second, the test will start automatically.
- It is possible to make the same battery test in the same conditions, but with no AC mains. It is not recommended, because depending on the status of the batteries and load level connected at the output, there could be a break in the power supply, which would mean a fault in the load power supply.
- With this test, it is able to detect if the batteries are low, open or not connected. It is possible to automate this test periodically by setting the time to the required by the end-user.

#### 5.1.7. Alarm silencer.

- The acoustic alarm is activated when the equipment works on battery mode. If it disturbs, it can be silenced by pressing for more than 1 second the key «ON»/«MUTE».

The alarm will be automatically activated again due to low battery (end of back up time). When it happens, loads and UPS have to be shutdown, because the equipment will break the output voltage in short.

- If the alarm on bypass mode disturbs, press the key «ON»/«MUTE» for more than 1 second to deactivate it. This action will not affect to the warning and/or alarm fault.

#### 5.1.8. EPO (Emergency Power Output).

- Also it is known as RPO (Remote Power Output).



Check that the connector of Fig. A is inserted, before proceeding with the start up.

When it is activated, the output of the equipment doesn't supply voltage and the screen of the LCD panel shows the code «30». The EPO acronym is displayed in the screen of the LCD panel instead of the output voltage figure.

It is a special situation, where it is done an immediate break of the UPS output voltage and alarms, as a preventive or emergency measures.

The EPO condition leaves the loads with no power supply, but the UPS is not shutdown. To do it, the EPO condition has to be released previously and then shutdown the equipment through the key «OFF» (see table 4). To start up the UPS press over the key «ON» (see table 4).

## 6. Control panel with LCD.

### 6.1. Control panel.



Fig. 10. Control panel view.

Key	Function	Description
	SELECT key	UPS on bypass mode, the output voltage, frequency and bypass enabling/disabling can be selected by pressing the key <b>SELECT</b> and validated with <b>ENTER</b> .
	ENTER key	
<b>OFF</b>	UPS shutdown	Press for more than 1 sec. the key <b>OFF</b> . The inverter is shutdown and the output is transferred over the bypass. If there is power supply and bypass is activated (code «1»), the outputs (schuko outlets and specific terminals) supplies voltage direct from mains through the static bypass. Consider by default that the bypass is deactivated from factory (code «0»), so in this conditions when pressing the key <b>OFF</b> , there will not be voltage at the output. With this key an alarm can also be deactivated on bypass mode.
<b>ON MUTE</b>	UPS start up	Press for more than 1 sec. the key <b>ON</b> . An automatic battery test is done and then the inverter is started up. Each time that the inverter is started up, an automatic battery test is done.
	Acoustic alarm silencer	With the equipment started up, the acoustic alarm on battery mode can be silenced, by pressing the over the key <b>ON</b> , of double function, in this case as <b>MUTE</b> . It doesn't disable the alarm permanently, because when any alarm is activated again, including the silenced on, the acoustic alarm is activated again.
	Battery test	When pressing this key, the equipment can make the battery test, on line mode, on ECO mode or on converter mode.

Table 4. Functionality of the buttons or keypad from control panel.

- The UPS has a control panel, which includes the following parts:
  - Four buttons or keys, see table 4.
  - A LCD panel.

Display	Function
<b>Input information</b>	
<b>888V<sub>AC</sub></b>	It displays the input voltage value, which will be showed from 0 to 999 Vac.
<b>88 Hz</b>	It displays the frequency value of the input voltage, which will be showed from 0 to 99 Hz.
<b>H</b>	It displays that the input voltage is higher than the SPEC range and the UPS runs on battery mode.
<b>L</b>	It displays that the input voltage is lower than the SPEC range and the UPS runs on battery mode.
<b>Output information</b>	
<b>888V<sub>AC</sub> (*)</b>	It displays the output voltage value, which will be showed from 0 to 999 Vac.
<b>88 Hz</b>	It displays the frequency value of the output voltage, which will be showed from 0 to 99 Hz.
<b>Load information</b>	
<b>188 %<sup>W</sup><sub>VA</sub></b>	It displays the % of the load in W or VA, the maximum value will be showed from 0 to 199% only.
<b>SHORT</b>	It displays that the output is short-circuited and the UPS could be shutdown.
<b>OVERLOAD</b>	It displays that the load overcomes the SPEC range.
<b>Battery information</b>	
<b>888V<sub>DC</sub></b>	It displays the battery voltage value, which will be showed from 0 to 999 Vdc.
<b>188 %</b>	It displays the % of the battery capacity, which will be showed from 0 to 199%.
<b>OVER CHARGE</b>	It displays that the battery is overcharged, and the UPS could transfer to battery mode.
<b>LOW</b>	It displays that the battery is low and the UPS could be shutdown shortly.
<b>Information of Mode/Fault/Warning codes</b>	
<b>FAULT</b> <b>MODE 88</b> <b>WARNING</b>	It displays the UPS operating mode. It will show the Mode/Fault/Warning codes, which are identified in table 6 this section.
<b>Inverter operating information</b>	
<b>INVERTER</b>	It displays that the inverter is running.
<b>Bypass operating information</b>	
<b>BYPASS</b>	It displays that the bypass is activated.
<b>Information of output voltage and frequency and status of bypass</b>	
<b>208V<sub>AC</sub> 220V<sub>AC</sub></b> <b>230V<sub>AC</sub> 240V<sub>AC</sub></b>	They are the eight selectable output voltage values with the UPS on standby or bypass mode. One of them can be activated at the same time only.
<b>50 Hz</b> <b>60 Hz</b>	They are the two selectable frequency values of the output voltage with the UPS on standby or bypass mode. One of them can be activated at the same time only.
<b>Bypass disable</b> <b>Bypass enable</b>	Selection of bypass enabled/disabled with the UPS on standby or bypass mode. One of them can be activated at the same time only.

(\*) Screen that UPS, ECO or CVF can be selected as operating modes of the equipment, where:

**UPS:** Setting of normal inverter (Line mode).

**ECO:** Setting of Economy mode (Standby mode).

**CVF:** Setting of the equipment as frequency converter.

The detailed illustration of the three modes and operation of the configuration are described next.

Table 5. LCD panel messages and their functions.



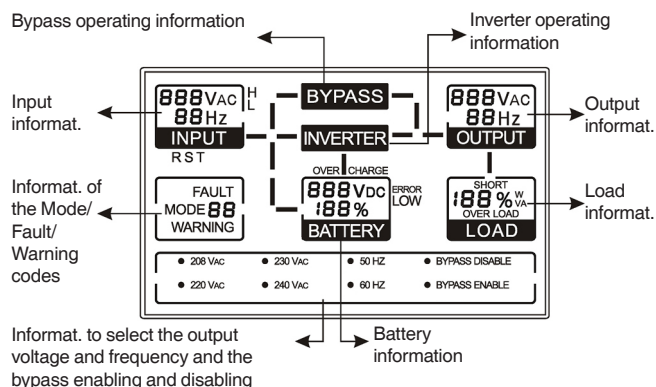


Fig. 11. Display LCD panel control description.

## 6.2. Setting and configuration of the control panel.

Operating mode	Code
<b>Operating codes</b>	
No output mode	0
Bypass mode	1
Line mode	2
Battery mode	3
Battery test mode	4
ECO mode	5
Converter mode	6
<b>Fault codes</b>	
Bus fault	05
Inverter fault	06
Overload fault	07
Overtemperature fault	08
Inverter short-circuit	14
DC bus short-circuit	28
<b>Warning codes</b>	
Wiring fault	09
Fan fault	10
Battery overvoltage (over-charged)	11
Low battery	12
Charger fault	13
DC-DC high temperature	21
High inverter temperature	24
High ambient temperature	25
High mains voltage (OVCD action)	26
Open battery	27
Overload	29
EPO "On" (connector Fig. A removed or external button "On")	30

Table 6. Code list and their meaning.

All operating codes of fault or warning that can be displayed in the LCD panel of the synoptic, are listed in table 6. Several codes can be activated or displayed at the same time, which correspond to an operating mode, to a warning or even some fault alarms at the same time. Each one of these codes will be displayed cyclically in

the LCD screen, less when one or several alarms are activated. In the last case the LCD panel will display the alarm or the alarms cyclically only, and the operating modes or warnings will not be shown.

### 6.2.1. No output mode, code «0».

The LCD panel on no output mode is shown in figure 12. The information about mains, battery, UPS output and load will be displayed. The UPS operating code is «0».

On this mode, the UPS doesn't supply output voltage, but it is still charging the batteries.

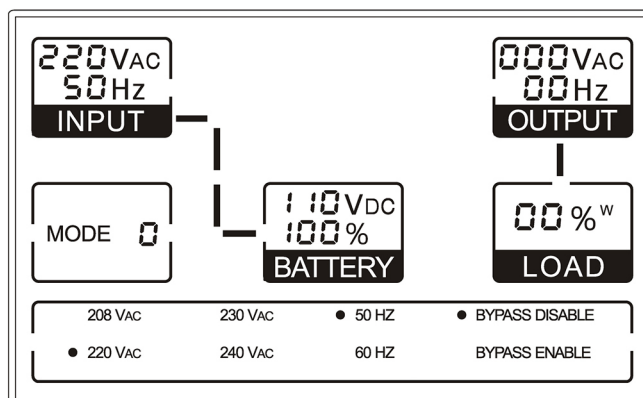


Fig. 12. Screen of operating mode code "0", no output mode.

### 6.2.2. Bypass mode, code «1».

The LCD panel on bypass mode is shown in figure 13. The information about mains, battery, UPS output and load will be displayed. The UPS operating code is «1».

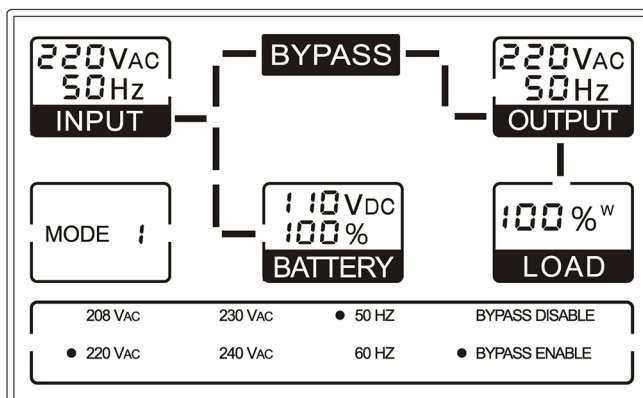


Fig. 13. Screen of operating mode code "1", Bypass mode.

In the same figure that the «BYPASS» stage is displayed (frame with BYPASS inscription inside) and active, it means that the bypass is supplying the used power by the load/s from mains directly, through the internal filter and at the same time the batteries are being charged.

The UPS acoustic alarm will beep every two minutes.

On this operating mode, the UPS doesn't have back up time function, so in case the power supply fails the loads will be shut-down due to the lack of energy.



### 6.2.3. Line mode.

The LCD panel on line mode is shown in figure 14. The information about mains, battery, UPS output and load will be displayed. The UPS operating code is «2».

In the same figure that the «INVERTER» stage is displayed (frame with INVERTER inscription inside) and active, it means that the inverter is supplying the used power by the load/s and at the same time the batteries are being charged.

If the output is overloaded, the percentage of load and the acoustic alarm will be triggered activated with two beeps every second. It is needed to shutdown the noncritical loads in order to decrease the percentage of load below the 90% of its nominal capacity.

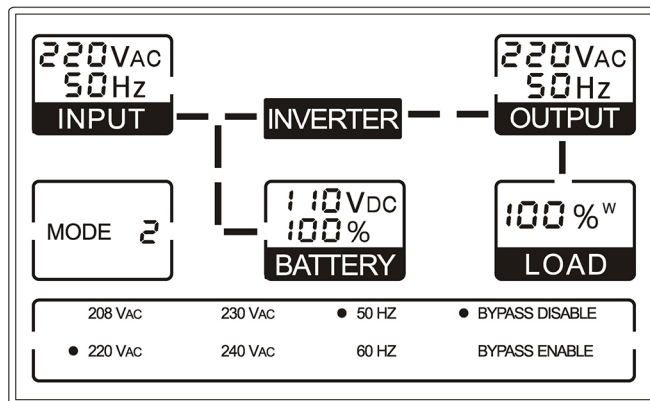


Fig. 14. Screen of operating mode code «2», Line mode.

### 6.2.4. Battery mode / Battery test mode.

The LCD panel on battery mode is shown on figure 15. The information about mains, battery, UPS output and load will be displayed. The UPS operating code is «3».

In the same figure that the «INVERTER» stage is displayed (frame with INVERTER inscription inside) and active, it means that the inverter is supplying the used power by the load/s, but the batteries are not being charged due to the lack of mains or wrong mains.

When the UPS works on battery mode, the acoustic alarm will be triggered every four seconds. If the button «ON» of the front panel is pressed for more than 1 second, the alarm will be silenced. Press the button «ON» for more than 1 second again, in order to re-activate the acoustic alarm function.

If the UPS is working on battery mode and the input line voltage is higher than the specific range the of the equipment, there will be displayed a letter «H» as an alarm mode. Meanwhile if the input line voltage is lower than the specific range of the equipment, there will be displayed a letter «L» as an alarm too. In case there is an input mains failure, any letter will not be displayed and voltage and frequency meters will be shown as zero.

The same screen of figure 16 will be shown for battery test mode and the letters «H» or «L» will be displayed during the test, if the input is higher or lower than the specific range of the equipment. The operating mode code of the UPS is «3» for battery mode and «4» for battery test mode.

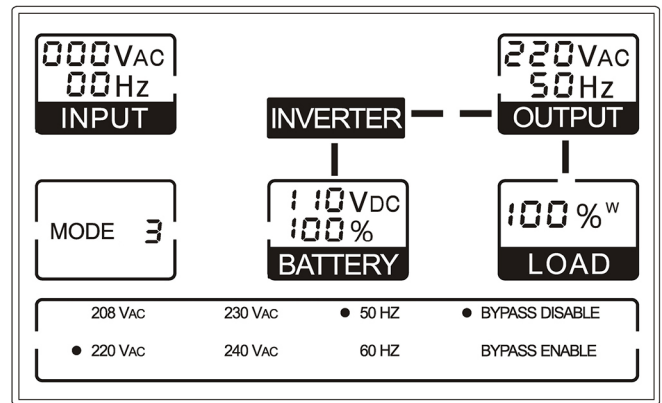


Fig. 15. Screen of operating mode code «3», Battery mode.

### 6.2.5. Wrong mode.

It is considered as wrong mode any of the fault or warning codes shown in table 6. Also a warning word can be displayed in the LCD panel, i.e. «SHORT», in order to identify that the equipment or load are short-circuited and therefore the UPS is on inverter fault mode. See table 7 of chapter 7.

### 6.2.6. ECO mode (Economy).

It is also known as high efficiency mode (HE). The UPS operating code of ECO mode is «5».

On ECO operating mode, the load is supplied from mains directly through the internal filter, meanwhile the voltage and frequency are inside the preset range, so a high efficiency is achieved.

When mains is wrong or there is a fault in the energy, the UPS transfers to battery mode and the load will be supplied from batteries till the normal conditions of the electrical mains are restored.

The ECO mode can be activated by means of the screen, or software (Winpower, ...).

It has to be considered that the transfer time of ECO mode to battery mode is less than 10 ms. But for some sensitive loads, it is still too much, so act in consequence for each particular case when activating the ECO mode.

### 6.2.7. Converter mode.

The UPS operating code on Converter mode is «6». On this operating mode, the UPS works with a fix output frequency (50 Hz or 60 Hz).

When mains is wrong or there is a blackout, the UPS will transfer to battery mode and the load will be supplied from batteries, till the normal conditions of the electrical mains are restored.

The Converter mode can be activated by means of the setting screen, or software (Winpower, ...).

It has to be considered that on this operating mode, the power rate of the equipment is derated up to the 60 % of the nominal.

### 6.3. Settings through the LCD panel of the synoptic.

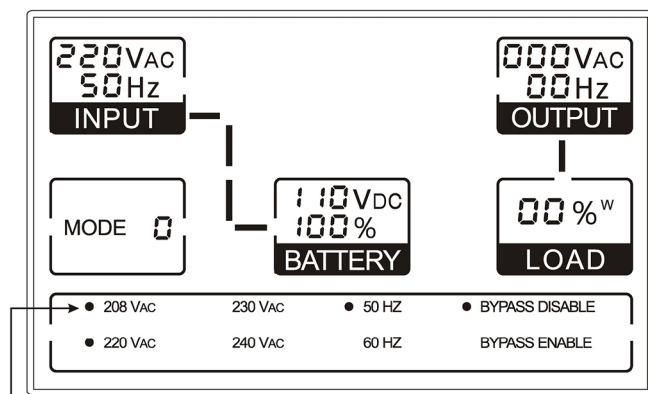
Output voltage and frequency, bypass status, ECO mode and Converter mode can be set through the LCD panel of the UPS directly. Output voltage can be set to 208 V, 220 V, 230 V and 240 V. Output frequency can be set to 50 Hz or 60 Hz. The UPS operating mode can be set among line mode, ECO mode and converter mode. The Bypass can be enabled or disabled. Nevertheless, the settings can only be done with the UPS on Bypass or no output modes.

On Bypass mode or no output mode, press the button « $\updownarrow$ » (Select) of the LCD panel for more than one second and the black dot will blink beside the figure «208 V» of the LCD panel. If the button « $\updownarrow$ » (Select) is pressed again, the black dot will be moved through the rest of figures with each pulsation: «220V», «230V», «240V», «50Hz», «60Hz», «Bypass disable», «Bypass enable», «UPS», «ECO», «CVF» and finally will return back to the initial point «208 V». If the key « $\leftarrow$ » (Enter) is pressed for more than second when the black dot is over the figure to select, the black dot will not blink and the setting of the output voltage or frequency or the bypass status or the operating mode will be set to the new selected figure. If during the next 10 seconds or more, it is not pressed any key, even the button « $\leftarrow$ » (Enter) or the button « $\updownarrow$ » (Select), the black dot will disappear without doing any setting.

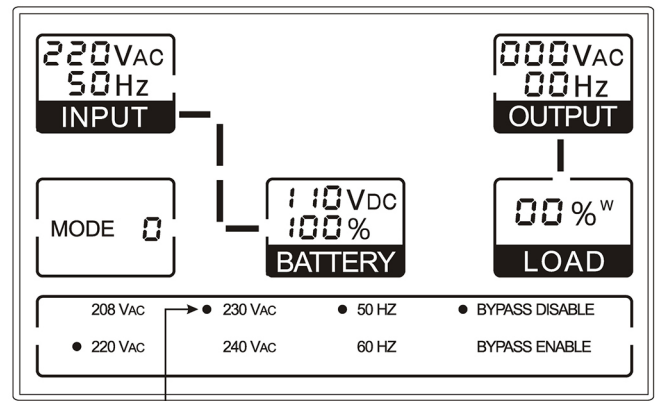
One voltage or frequency values can be selected only, and their values will be changed once the UPS is started up through the button «ON».

The UPS will change to bypass mode after several seconds that the «bypass enable» has been selected, as well as no output voltage mode some seconds later that the «bypass disable» option is selected. The mode change will only be active when the UPS is started up through the button «ON».

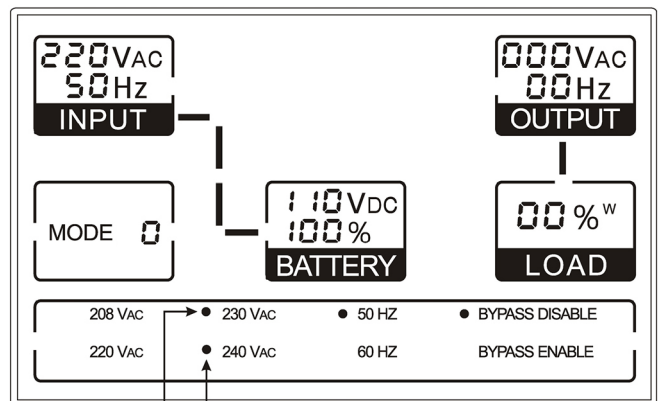
Example for changing the output voltage from 220V to 230V through the LCD panel:



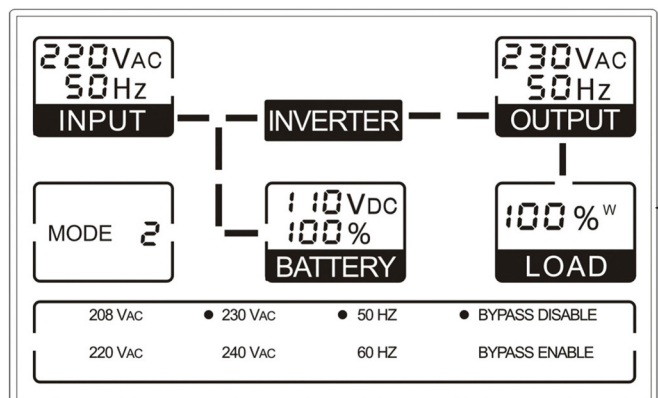
**Step 1:** A blinking black dot appears beside the 208V figure after pressing the key « $\updownarrow$ » (Select) of the LCD panel, for more than 1 sec..



**Step 2:** The blinking black dot is shown beside the 230V after pressing the key « $\updownarrow$ » (Select) twice.



**Step 3:** When pressing over the key « $\leftarrow$ » (Enter) for more than 1 second, the new selected value is confirmed.



**Step 4:** The output voltage is set to 230 V after starting up the UPS.

Fig. 16. Steps 1 to 4: Example of how to set the figures of an equipment.

## 7. Maintenance, warranty and service.

### 7.1. Battery maintenance.

- Pay attention to the safety instructions regarding battery and the stated in section 1.2.3.3.
- The UPSs from **SLC TWIN PRO** series only requires a minimum maintenance. The used battery in the standard models is lead acid, sealed, VRLA and maintenance free. These models require a minimum of reparations. The only requirement is to charge the UPS regularly, in order to prolong the battery lifetime. Meanwhile, it is connected to the power supply, never mind if the UPS is ON or OFF, it will keep the batteries charged and will give protection against overcharging and undercharging.
- The UPS has to be charged once, every 4 or 6 months if it has not been used for long time.
- In hot areas, battery has to be charged every 2 months. The charging time has to be 12 hours as minimum.
- Under normal conditions, the battery lifetime is from 3 to 5 years 25° C. In case that the battery was not in good conditions, it has to be replaced before. This replacement has to be done by qualified staff.
- Always replace them with the same quantity and type.
- Do not replace one battery only. All batteries have to be replaced at the same time and following the instructions of the manufacturer.
- Usually, the batteries should be charged and discharged every 4 or 6 months. The charging would be started after shutdown the UPS due to a low battery (discharging). Charging time for standard UPS should be 12 hours as minimum.

#### 7.1.1. Notes for installing and replacing the batteries.

- If it is needed to replace the connection of any wire, purchase original parts through authorised distributors or service centres in order to avoid overheating and sparks with fire risk because the size is not enough.
- Do not short the + and - poles of the batteries, there is risk of fire or electrocution.
- Be sure that there is no voltage before touching the batteries. Battery circuit is not isolated from the input. Hazardous voltages can be found between the battery and earth terminals
- Although the input circuit breaker the switchgear panel is turned off, the internal parts of the UPS are still connected to the batteries, so there are hazardous voltages inside.  
Therefore, before doing any reparation or maintenance task, the internal battery fuses have to be removed and/or the interlink connections between them and the UPS.
- Batteries have hazardous voltages. The battery maintenance and replacement have to be done by qualified personnel and familiarised with them. Nobody else can manipulate them.

### 7.2. UPS Trouble Shooting guide.

If the UPS doesn't work properly, check the information given by the LCD of the control panel. Try to solve the problem by means of the established steps in the table 7. In case the problem persists, consult with our Service and Technical Support **S.T.S.**

When it is needed to contact with our Service and Technical Support **S.T.S.** , provide the following information:

- UPS model and serial number.
- Date when the problem occurred.
- Complete description of the problem, including the information given by the LCD panel and the status of the alarms.
- Power supply condition, type of load and the level connected to the UPS, ambient temperature, cooling conditions.
- Information of the batteries (capacity and battery quantity), if the equipment is (B0) or (B1) -with external batteries-.
- Other informations that you may think that they are important.

## 7.2.1. Troubleshooting guide. Warning indications.

If the UPS doesn't work properly, before calling S.S.T. try to resolve the problem using the information in the following table:

Problem	Possible cause	Solution
No warning indications, although the UPS is connected to mains.	No input voltage.	Check the UPS power cord, the wall outlet and installation wiring. Check the circuit breaker switch of the distribution panel is turned «ON».
The screen of LCD panel shows the code «1», although there is mains.	Inverter is not started up.	Press the key «ON» for more than 1 second.
The screen of the LCD panel shows the code «3» and the acoustic alarm beeps every 4 seconds.	Mains has failed or mains voltage and/or frequency are out of range. It is not connected to the wall outlet or the circuit breaker switch of the distribution panel has been tripped.	Loads are supplied on battery mode. Check that: The UPS has input voltage and the values of the voltage and frequency are correct. It is connected to the wall outlet and the protection of the distribution panel has not tripped.
Back up time is reduced as regards to the nominal.	Batteries are not completely charged or some of them are damaged.	Charge the batteries for 5 - 8 hours as minimum after checking the capacity. If the problem persists, consult with the S.T.S..
Fan fault.	Wrong fan.	Check if the fan is working properly.
Battery overvoltage.	Battery is over charged.	Automatic transfer of the equipment to battery mode and return back to line mode when AC mains conditions and batteries are normal.
Low battery.	Battery voltage is too low.	When the acoustic alarm beeps every second, it means the battery is at the end of back up time. Shutdown the loads, in short the UPS will break the output voltage so the load/s will not be supplied too.
Charger fault.	Charger is faulty.	Contact with the S.T.S..
High temperature on DC/DC converter.	Internal UPS temperature is too high.	Check the UPS cooling (grids are blocked, fan operating); check the ambient temperature.
High temperature on inverter.	Internal UPS temperature is too high.	Check the UPS cooling (grids are blocked, fan operating); check the ambient temperature.
High ambient temperature.	Room ambient temperature is too high.	Check the correct cooling of the location of the equipment.
High input voltage.	AC input voltage is too high (out of range).	Automatic transfer to battery mode and the return back to line mode when the AC mains conditions are inside the preset range of the UPS.
Battery open.	Battery set is wrong connected.	Make a battery test to confirm it. Check that the battery set is connected to the UPS. In B1 and/or B0 equipments check the battery switch si turned «ON».
Overload.	Overload	Check the loads and shutdown the non-critical loads (printers, scanner,... ). Check , i.e.: if there is any damaged load with a short-circuit.
Wiring fault.	Input phase and neutral wires are swapped.	Swap the input connection.
EPO activated.	EPO function is enabled.	Deactivate the EPO.
Bus fault.	UPS internal fault.	Contact with the S.T.S..
Inverter fault.	UPS internal fault.	Contact with the S.T.S..
Overtemperature fault.	Overtemperature.	Check the UPS cooling (grids blocked, fan operating); check the ambient temperature.
Inverter short-circuit.	Short-circuited output.	Remove all the loads. Shutdown the UPS and check if the UPS output and load/s are short-circuited. Make sure that the short-circuit has been cancelled and the UPS doesn't have any internal fault before starting up the equipment again.
Bus short-circuit	UPS internal fault.	Contact with the S.T.S..

Table 7. Troubleshooting guide. Other circumstances or conditions.

## 7.3. Warranty conditions.

The limited warranty only applies to those products that you acquire for commercial or industrial use in the normal development of your business.

### 7.3.1. Covered product.

UPS SLC TWIN PRO series.

### 7.3.2. Warranty terms.

This product is guaranteed against any parts and/or labour defect for 12 months period from its commissioning by **our company** staff or other specifically authorised, or 18 months from its factory delivery, whichever expires first. In case of failure of the product inside the warranty period, we must repair, at our facilities at no cost, the faulty part or parts. The transport expenses and packaging will be borne to the user..

We guarantees for period time higher than 10 years, the availability of parts and spare parts, as hardware as software, as well as a complete assistance regarding the reparations, components replacement and software updating.

### 7.3.3. Out of scope of supply.

**Our company** is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of repairing or not authorized modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

## 7.4. Description of the available maintenance and service contracts.

When the warranty is expired, and adapting to the customer's needs, has several maintenance modalities:

### Preventive.

It guarantees a higher safety to preserve the correct operating of the equipments with a yearly preventive visit, in which the specialised technicians of **our company** make several tests and sets in the systems:

- Measurement and write down input currents and voltages among the phases.
- Measurement and write down output currents and voltages among the phases.
- Measurement and write down floating currents and voltages, discharging and charging batteries.
- Checking the logged alarms.
- Checking and testing the measurements of the digital LCD panel:
  - ☐ Input voltages

- ☐ Input currents
- ☐ Output voltages
- ☐ Output currents
- ☐ Temperatures
- ☐ Battery voltage and currents.

- Check the battery status.
- Check the fan status.
- Bypass test.
- Make a general cleaning of the equipment.
- Controlling the mechanical parts and temperatures.

This way, it is guaranteed the perfect operating and the possible coming faults are avoided.

These supervisions are usually done without shutdown the equipment. In those cases that a shutdown were needed, date and time would agree with the customer to do the task.

This maintenance modality covers, inside the working timetable, all the journey expenses and manpower.

### Corrective.

When a fault occurs in the equipment operating, and previous notice to our Service and Technical Support (**S.T.S.**), in which a specialized technician will establish the failure scope and he will determine a first diagnostic, the corrective action starts.

The needed visits for its correct resolution are unlimited and they are included inside the maintenance modalities. It means that in case of failure, we will check the equipments as many time as it were needed.

Both preventive and corrective maintenance contracts, is possible to determine the **intervention timetable and response times**, as well as **exclusion or inclusion parts in partial or total way**, with the purpose to be adapted to the customer's need.

Consult our Website to have more information.

## 7.5. Technical service network.

Coverage, both national and international, from our Service and Technical Support (**S.T.S.**), can be found in our Website.



## 8. Annexes.

### 8.1. General technical specifications.

Available powers (kVA / kW)	0.7 / 0.56	1 / 0.8	1.5/ 1.2	2 / 1.6	3 / 2.4
Technology	On-line double conversion, PFC, double DC bus				
Rectifier					
Tipology of the input	Single phase				
Quantity of wires	3 wires - Phase R(L) + Neutral (N) and earth				
Nominal voltage	208 / 220 / 230 / 240 V AC (power reduction of 10% to 208 V AC)				
Input voltage range with 100 % load	176÷276 V AC				
Input voltage range with 50 % load	110÷300 V AC				
Voltage range of transference:	Depending on the load percentage between 100 and 50 %				
- Low mains voltage	176 / 110 V AC (±3 %)				
- Restore from low mains	186 / 120 V AC (±3 %)				
- High mains voltage	300 V AC (±3 %)				
- Restore from mains high	290 V AC (±3 %)				
Frequency	50 / 60 Hz (autosensing)				
Input frequency range	± 10 % (45-55 / 54-66 Hz)				
THDi	< 5 % at full load				
Power factor	> 0.99 (at full load)				
Inverter					
Technology	PWM				
Switching frequency	19.2 kHz				
Wave shape	Pure sinewave				
Nominal voltage	208 / 220 / 230 / 240 V AC				
Output voltage accuracy	± 2 %				
Voltage THD with linear load	< 2 %				
Voltage THD with non-linear load	< 5 %				
Output voltage recovering time	100 ms. (IEC 62040-3 non-linear load)				
Transient response of the output voltage (with load fluctuation of 0 %-100 %-0 %)	± 9 %				
Transient response of the output voltage (with load fluctuation of 20 %-100 %-20 %)	± 6 %				
Frequency	With mains present, synchronised at nominal input (45-55 / 54-66 Hz)				
Slew rate	Free running, back up time mode 50 / 60 ±0.2 Hz				
Power factor	1 Hz/sec.				
Power factor	0.8 (by default)				
Power factor	0.6 to 1				
Permissible load power factor	0.3 inductive to 1				
Transfer time, inverter to battery	0 ms.				
Transfer time, inverter to bypass	< 4 ms.				
Transfer time, inverter to ECO	0 ms.				
Transfer time, ECO to inverter	< 10 ms.				
Efficiency at full load, line mode with 100% charged battery	> 87 %				
Efficiency at full load, on battery mode	> 84 %		> 87 %		
Efficiency at full load, on ECO mode	> 93 %		> 94 %		
Overload, line mode	105-110 %, 1 min.				
	110-125 %, 30 sec.				
	125-150 %, 10 sec.				
	> 150 %, 1 sec.				
Overload, battery mode	105-110 %, 1 min.				
	110-125 %, 30 sec.				
	125-150 %, 10 sec.				
	> 150 %, 1 sec.				
Crest factor	3:1				
Static bypass					
Type	Hybrid (thyristors in antiparallel + relay)				
Nominal voltage	208 / 220 / 230 / 240 V				
Nominal frequency	50 / 60 Hz ±4 Hz				
Batteries					
Voltage / capacity	12 V DC / 7 Ah				
Quantity of batteries in serial / set voltage	3 / 36 V DC		8 / 96 V DC		
Low battery voltage, block / set	11.4 V DC / 34.2 V DC		11.4 V DC / 91.2 V DC		

Available powers (kVA / kW)	0.7 / 0.56	1 / 0.8	1.5/ 1.2	2 / 1.6	3 / 2.4
End battery voltage:					
- From 0-30 % load, block / set	10.7 V DC / 32.1 V DC		10.7 V DC / 85.6 V DC		
- From 30-70 % load, block / set	10.2 V DC / 30.6 V DC		10.2 V DC / 81.6 V DC		
- From > 70 % load, block / set	9.5 V DC / 28.5 V DC		9.5 V DC / 76 V DC		
Internal battery charger					
Type of charge	I / U (Constant current / constant voltage)				
Constant current / constant voltage	1 A / 13.65 V DC batterie				
Floating voltage, block / set	13.65 V DC / 40.95 V DC		13.65 V DC / 109.2 V DC		
Maximum charging current	1 A				
Recharging time	5 hours at 90%				
Leakage current	< 150 µA (version B1 < 300 µA)				
Voltage / temperature compensation	Not available				
Internal battery charger option (B1)					
Maximum charging current	4 A or 8 A		4 A, 8 A or 12 A		
Generals					
Communication ports	USB				
Monitoring software	WinPower (free download)				
Noise level at 1 m.	< 50 dB				
Operating temperature	0.. 45 °C				
Storage temperature	– 15.. + 50 °C				
Storage temperature without batteries	– 20.. + 70 °C				
Operating altitude	< 1000 m (for higher altitudes correct according to table 9)				
Relative humidity	0-95 % non-condensing				
Protection degree	IP20				
Dimensions -Depth x Width x Height- (mm)	400 x 145 x 220		460 x 192 x 347		
Weight (kg) -Standard UPS-	13	14	30	31	33
Weight (kg) -B0 version UPS-	6,5	7,5	11	12	13
Weight (kg) -B1 version UPS-	7	8	12	13	14
Safety	EN-IEC 62040-1; EN-IEC 60950-1				
Electromagnetic compatibility (EMC)	EN-IEC 62040-2				
Marking	CE				
Quality system	ISO 9001 e ISO 140001				

Table 8. General technical specifications.

Altitude (m.)	1000	1500	2000	2500	3000	3500	4000	4500	5000
Power	100%	95%	91%	86%	82%	78%	74%	70%	67%

Table 9. Correction of power rate as regards to operating altitude.

## 8.2. Glossary.

- **AC.-** It is nominated as alternating current (abbreviation in Spanish CA and in English AC) to the electrical current in which the magnitude and direction varies in a cyclic way. The most common wave shape of the alternating current is sinewave, because the energy transmission is better. Nevertheless, some applications could need other period wave shapes, like triangular or square
- **Bypass.-** Manual or automatic, it is the physical junction between the input and the output electric device.
- **DC.-** The direct current (CC in Spanish, DC in English) is the continuous electron flow through a cable between two points with different potential. Unlike the alternating current, in direct current the electrical loads always flow in the same direction from the highest potential point to the lowest one. Although, usually the direct current is identified with the constant current (for example the one supplied by the battery), it is continuous any current that always maintain the polarity.
- **DSP.-** It is the acronym of Digital Signal Processor. A DSP is a system based on a processor or microprocessor that has instructions in it, a hardware and an optimised software to develop applications where numerical operations are needed with very fast speed. Due to this, it is very useful to process analogical signals in real time: in a system that runs in this way (real time) samples are received, usually coming from an analogical/digital converter(ADC).
- **Power factor.-** It is defined as power factor, p.f., of an alternating current circuit, as the ratio between the active power, P, and the apparent power, S, or as the cosines of the angle that make the current and voltage vectors, designating as  $\phi$ , being  $\phi$  the value of that angle.
- **GND.-** The term ground, as its name states, refers to the potential of the earth surface.
- **EMI filter.-** Filter able to decrease the electromagnetic interferences, which is the perturbation that happens in a radio receptor or in any other electrical circuit caused by the electromagnetic radiation coming from an external source. Also it is known as EMI, ElectroMagnetic Interference, Radio Frequency Interference or RFI. This perturbation can derate or limit the efficiency of the circuit.
- **IGBT.-** The Insulated Gate Bipolar Transistor is a semiconductor device that is used as a controlled switch in power electronic circuits. This device has the feature of the gate signal of the effect field transistors with the capacity of high current and low voltage saturation of the bipolar transistor, combining an isolated FET gate for the input and a bipolar transistor as switch in a single device. The triggering circuit of the IGBT is as the MOSFET one, while the driving features are like the BJT.
- **Interface.-** In electronic, telecommunications and hardware, an interface (electronic) is the port (physical circuit) through which are sent or received signals from a system or subsystems toward others.
- **kVA.-** The voltampere is the unit of the apparent power in electrical current. In direct current is almost equal to the real

power but in alternating current can defer depending on the power factor.

- **LCD.-** LCD acronym of Liquid Crystal Display, device invented by Jack Janning, who was employee of NCR. It is an electric system of data presentation based on 2 transparent conductor layers and in the middle a special crystal liquid that have the capacity to orientate the light when trespassing.
- **LED.-** LED acronym of Light Emitting Diode, is a semiconductor device (diode) that emits light almost monochrome with a very narrow spectrum, it means, when it is direct polarized and it is crossed by an electric current. The colour, (wave longitude), depends on the semiconductor material used in its construction, being able to vary from the ultraviolet one, going through the visible spectrum light, to the infrared, receiving these last ones the denomination of IRED (Infra Red Emitting Diode).
- **Circuit breaker.-** A circuit breaker or switch, is a device ready to break the electrical current of a circuit when it overcomes the maximum set values.
- **On-Line mode.-** Regarding to an equipment, it is on line when it is connected to the system, and it is in operation, and usually has its power supply turned on.
- **Inverter.-** An inverter, is a circuit used to convert direct current into alternating current. The function of an inverter is to change an input voltage of direct current into a symmetrical output voltage of alternating current, with the required magnitude and frequency by the user or the designer.
- **Rectifier.-** In electronic, a rectifier is the element or circuit that allows to convert the alternating current into direct current. This is done by rectifier diodes, which can be solid state semiconductors, vacuum or gassy valves as the mercury vapour. Depending on the features of the alternating current power supply used, it is classified as single phase, when they are fed by a single phase electrical mains, or three phase when they are fed by the three phases. Depending on the rectification type, they can be half wave, when only one of the current semi-cycles is used, or full wave, where both semi-cycles are used.
- **Relay.-** The relay(in French relais, relief) is an electromechanical device that works as a switch controlled by an electric circuit where, through an electromagnet, a set of contacts are moved and it allows to open or to close other independent electric circuits.
- **SCR.-** Abbreviation of «Silicon Controlled Rectifier», called commonly as Thyristor: semiconductor device of 4 layer that works as almost an ideal switch.
- **THD.-** They are the acronyms of «Total Harmonic Distortion». The total harmonic distortion is done when the output signal of a system is not equivalent to the one that enter into it. This lack of linearity affects to the wave shape, because the equipment has introduced harmonics that they were not in the input signal. As they are harmonics, it means multiple of the input signal, this distortion is not so dissonant and it is more difficult to detect.

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